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YOU MUST PURCHASE  
THE PROPOSAL IN ORDER  
TO SUBMIT A BID.**



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

JACK MARKELL  
GOVERNOR

CLEON L. CAULEY, SR  
ACTING SECRETARY

**VIA OVERNIGHT DELIVERY**

(302) 760-2030  
FAX (302) 739-2254

May 12, 2011

Contract No. T200809003.01  
Federal Aid Project No. IM-N056(35)  
SR1/I-95 INTERCHANGE  
New Castle County

Ladies and Gentlemen:

Enclosed is Addendum No. 4 for the referenced contract consisting of the following:

**NOTE: Technical questions concerning Addendum 4 will be entertained until noon on May 20, 2011.**

**The date for the receipt of bids remains THURSDAY, May 26, 2011. Bids will be received until 2:00 P.M., Local Time, the Bidder's Room (B1.11.01), in the DeIDOT Transportation Administration Center, 800 Bay Road, U.S. Route 113 South, Dover, DE.**

1. One (1) page, Bid Proposal Cover, revised, to be substituted for the same page in the Proposal.
2. One (1) page, Location/Description, page i, revised, to be substituted for the same page in the Proposal.
3. Six (6) pages, Table of Contents, pages iii through viii, revised, to be substituted for the same pages in the Proposal.
4. Item Number 623002 , **DELETED**, to be removed from the Proposal.
5. Two (2) pages, General Notices, pages 1 through 2, revised, to be substituted for the same

pages in the Proposal and one (1) page, page 2A, new, to be added to the Proposal..

6. One (1) page, Critical DBE Requirement, page 13, revised, to be substituted for the same page in the Proposal.
7. One (1) page, State of Delaware Prevailing Wages, page 33, revised, to be substituted for the same page in the Proposal.
8. Four (4) pages, Special Provisions, 602616 - Waterproofing PCC Masonry Surfaces, pages 89A through 89D, new, to be added to the Proposal.
9. Seven (7) pages, Special Provisions, 602772 - Mechanically Stabilized Earth Walls, pages 92 through 97A, revised, to be substituted for the same pages in the Proposal.
10. Nine (9) pages, Special Provisions, 602774 - Masonry For Light Pole Foundation (CY), pages 99 through 107, revised, to be substituted for the same pages in the Proposal.
11. Twelve (12) pages, Special Provisions, 605500 - Cantilever-Sign Support and Foundation, pages 128 through 139, revised, to be substituted for the same pages in the Proposal.
12. Twelve (12) pages, Special Provisions, 605523 - Box Truss Type Overhead Sign Supports and Foundations, pages 142 through 153, revised, to be substituted for the same pages in the Proposal.
13. One (1) page, Special Provisions, 619501 - Production Pile Restrike, page 184, new, to be added to the Proposal.
14. Four (4) pages, Special Provisions, 619519 - Dynamic Pile Testing By Contractor, pages 185 through 188, revised, to be substituted for the same pages in the Proposal.
15. One (1) page, Special Provisions, 720512 - P. C. C. Safety Barrier Permanent, Double Face, page 200, revised, to be substituted for the same page in the Proposal.
16. Two (2) pages, Special Provisions, 720532 - Install Portable Impact Attenuator, pages 205 through 206, revised, to be substituted for the same pages in the Proposal.
17. Two (2) pages, Special Provisions, 744520 - Conduit Junction Well, pages 227 through 228, revised, to be substituted for the same pages in the Proposal.
18. Four (4) pages, Special Provisions, 746519 - Aluminum Light Standard With Single Davit Arm, 40' Pole, pages 242 through 245, revised, to be substituted for the same pages in the Proposal.
19. One (1) page, Special Provisions, 746537 - Relocating Existing Light Standards, page 246, revised, to be substituted for the same page in the Proposal.
20. One (1) page, Special Provisions, 746592 - Replace/Adapt Existing Transformer Bases, page 248, revised, to be substituted for the same page in the Proposal.
21. Two (2) pages, Special Provisions, 746620 - Relocation of Existing Lighting Tower, pages

- 251 through 252, revised, to be substituted for the same pages in the Proposal.
22. Five (5) pages, Special Provisions, 746621 - Lighting Towers and Installation, pages 253 through 257, revised, to be substituted for the same pages in the Proposal.
  23. Three (3) pages, Special Provisions, 746717 - Electric Service on Pedestal with Service Riser, pages 260 through 262, revised, to be substituted for the same pages in the Proposal.
  24. Six (6) pages, Special Provisions, 759501 - Field Office, Special, pages 309 through 314, revised, to be substituted for the same pages in the Proposal.
  25. One (1) page, Special Provisions, 763564 - Special Bidding Procedure, page 340, revised, to be substituted for the same page in the Proposal.
  26. Five (5) pages, Utility Statement, revised, to be substituted for the same pages in the Proposal.
  27. Thirty-Two (32) pages, Bid Proposal Forms, pages 1 through 32, revised, to be substituted for the same pages in the Proposal.
  28. One (1) page, Bid Proposal Forms/Breakout Sheet 2A, Item 602772 - Mechanically Stabilized Earth Walls, revised, to be substituted for the same page in the Proposal.
  29. One (1) page, Bid Proposal Forms/Breakout Sheet 13, Item 605757 - High Performance Steel, revised, to be substituted for the same page in the Proposal.
  30. Three (3) items, Break-out Sheets, Bid Proposal Forms, items 207501, 720532, and 720534, **DELETED**, to be removed from the Proposal.
  31. Two (2) pages, Form Sheets, item 720532 - Install Portable Impact Attenuator and item 720534 - Furnish Portable Impact Attenuator, new, to be added to the Proposal.
  32. One (1) page, Diesel Fuel Cost Price Adjustment Option, revised, to be substituted for the same page in the Proposal.
  33. Ninety-five (95) sheets, Construction Plans, sheets 4, 5, 76, 77, 78, 79, 196, 198, 208, 210, 215, 219, 223, 226, 227, 255, 257, 267, 269, 271, 308, 310, 320, 322, 323, 350, 352, 363, 367, 369, 370, 373, 395, 397, 408, 410, 451, 452, 453, 454, 455, 456, 457, 458, 461, 461A, 465, 466, 467, 468, 469, 473, 474, 476, 477A, 478, 486, 487, 488, 493, 495, 504, 514, 518, 522, 525, 533, 537, 542, 546, 551, 555, 559, 570, 575, 583, 590, 596, 602, 610, 619, 624, 625, 670, 685, 699, 700, 700A, 701, 703, 704, 706, 707, 709A, and 710, **revised**, to be substituted for the same sheets in the Plan Set, two (2) sheets, sheets 462A and 477A1, **new**, to be added to the Plan Set, and two (2) sheets, sheets 462 and 477, **DELETED**, to be removed from the Plan Set.
  34. For proposal holders with the electronic bid option only, Amendment Disk No. 3.

Please note the revisions listed above and submit your bid based upon this information.

Sincerely,

A handwritten signature in black ink, appearing to read "Scott S. Gottfried". The signature is written in a cursive style with a horizontal line across the middle.

Scott S. Gottfried  
Competitively Bid Contracts Coordinator  
:ssg  
Enclosures

STATE OF DELAWARE



DEPARTMENT OF TRANSPORTATION

BID PROPOSAL

for

CONTRACT T200809003.01

FEDERAL AID PROJECT NO. IM-N056(35)

SR1/I-95 INTERCHANGE  
NEW CASTLE COUNTY

**PROSPECTIVE BIDDERS ARE ADVISED THAT THERE WILL BE A MANDATORY PRE-BID MEETING FOR THIS CONTRACT ON JANUARY 12 *14*, 2011 at 10:30 A.M. IN THE ~~DelDOT ADMINISTRATION CENTER, 800 BAY ROAD, U.S. ROUTE 113 SOUTH, DOVER, DELAWARE, 19903~~ *DELAWARE TECHNICAL AND COMMUNITY COLLEGE, STANTON CAMPUS CONFERENCE CENTER, 400 STANTON-CHRISTIANA ROAD, NEWARK, DE 19713.***

Completion Date 763564 - SPECIAL BIDDING PROCEDURES

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

Bids will be received in the Bidder's Room, Transportation Administration Center, 800 Bay Road, Dover, Delaware until 2:00 P.M. local time, **THURSDAY, MAY 26, 2011.**

**Contract No.T200809003.01**

**Federal Aid Project No. IM-N056(35)**

**SR1/I-95 INTERCHANGE  
NEW CASTLE COUNTY**

**LOCATION**

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

**DESCRIPTION**

The improvements consist of furnishing all labor and materials. This project is part of an overall turnpike improvement program to reduce congestion at the SR 1 / I-95 interchange. Construction of a new multiple-lane interchange will reduce the traffic weaving around the Christiana Mall, SR 1, and I-95 areas. The project will separate out local traffic movements from high speed movements., and other incidental construction in accordance with the location, notes and details shown on the plans and as directed by the Engineer.

**COMPLETION DATE**

All work on this contract must be complete in accordance with the date as determined by **Special Provision 763564 - SPECIAL BIDDING PROCEDURES.**

**It is the Department's intent to issue a Notice to Proceed such that work starts on or about September 12, 2011.**

**ELECTRONIC BIDDING**

This project incorporates the electronic bidding system Expedite 5.2b. Bidders wishing to use the electronic bidding option will find a bid file on the CD.

**PROSPECTIVE BIDDERS NOTES:**

1. No retainage will be withheld on this contract.
2. The Department has adopted an External Complaint Procedure. The procedure can be viewed on our website at: [www.deldot.gov/information/business/](http://www.deldot.gov/information/business/), or you may request a copy by calling (302) 760-2555.
3. Please note the Special Provision titled **Changes to Project Documents During Advertisement**. The Department is using an alternative method of providing bid documents for this contract.
4. Please note there are **TRAINEES** required for this project, and proposed Trainee Plans must be submitted as required. Number of required programs is listed in the Training Special Provisions within Contract General Notices. The program(s) must be submitted within 10 Calendar Days of notification of apparent low bidder status. Contract Award will not take place until acceptable On-the-Job (OJT) program plans are received by the Civil Rights Group of the Department. **Failure of the apparent low bidder to present copies of acceptable OJT Trainee Programs within 10 Calendar Days of notification of apparent low bidder status shall create a non-rebuttable presumption that the bid is non-responsive.**
5. **SUBMISSION REMINDER:**
  - a. Copy(ies) of the American Traffic Safety Services Association (ATSSA) Certification(s) when listed in the applicable plan notes.
  - b. Standard Specification Section 110.08 Site Reviewer requires that the name and DNREC certification number of each Site Reviewer if required shall be submitted to the Department. The level of certification and number required are listed in the applicable plan notes.

Note: Items a. and b. above require copies of the current certifications for those individuals proposed for use on this Contract.

Failure of the apparent low bidder to present copies of the required certifications within ten (10) calendar days after the bid opening shall create a non-rebuttable presumption that the bid is non-responsive.

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**CERTIFICATION**

**BID BOND**

**GENERAL NOTICES**

**CONTRACT LIQUIDATED DAMAGES**

The contract drawings and notes provide a sequence of construction for this contract.

**FAILURE TO OPEN PROJECT TO UNRESTRICTED HIGHWAY TRAFFIC ON TIME**

The total number of calendar days proposed by the bidder shall become the contract time for this project and shall be the basis for the determination of any contract time related adjustments to the contract.

Road User Costs of \$35,000.00/calendar day have been established for this project.

Interim Road User costs for delays in opening lanes along both SR1 and I95 will be enforced according to the below charts:

<b>Northbound I-95</b>			
<b>Contractor Penalties for Failure to Reopen Lanes</b>			
<b>Time All Lanes Reopened ("Verizon" time)</b>	<b>One Lane Closure</b>	<b>Two Lane Closure</b>	<b>Three Lane Closure / Full Closure with Detour</b>
5:00 AM to 5:14 AM	No Penalty	No Penalty	No Penalty
5:15 AM to 5:29 AM	\$2,000	\$2,000	\$2,000
5:30 AM to 5:44 AM	\$2,500	\$2,500	\$3,000
5:45 AM to 5:59 AM	\$3,000	\$3,000	\$4,000
6:00 AM to 6:14 AM	\$4,000	\$5,000	\$5,000
6:15 AM to 6:29 AM	\$5,000	\$8,000	\$12,000
6:30 AM to 6:44 AM	\$6,000	\$10,000	\$18,000
6:45 AM to 6:59 AM	\$8,000	\$15,000	\$25,000
Not Open by 7:00 AM	\$10,000	\$20,000	\$35,000
<b>For every hour, or portion thereof, after 7:00 AM, \$5,000 will be assessed up to a Day Total of \$80,000.</b>			
<b>Southbound I-95</b>			
<b>Contractor Penalties for Failure to Reopen Lanes</b>			
<b>Time All Lanes Reopened ("Verizon" time)</b>	<b>One Lane Closure</b>	<b>Two Lane Closure</b>	<b>Three Lane Closure / Full Closure with Detour</b>
5:00 AM to 5:14 AM	No Penalty	No Penalty	No Penalty
5:15 AM to 5:29 AM	No Penalty	\$1,000	\$2,000
5:30 AM to 5:44 AM	No Penalty	\$1,250	\$2,500
5:45 AM to 5:59 AM	No Penalty	\$1,500	\$3,000
6:00 AM to 6:14 AM	No Penalty	\$2,000	\$4,000
6:15 AM to 6:29 AM	No Penalty	\$2,500	\$5,000
6:30 AM to 6:44 AM	No Penalty	\$3,000	\$6,000
6:45 AM to 6:59 AM	No Penalty	\$4,000	\$8,000
Not Open by 7:00 AM	\$5,000	\$5,000	\$10,000
<b>For every hour, or portion thereof, after 7:00 AM, \$2,000 will be assessed up to a Day Total of \$35,000.</b>			

<b>Northbound SR 1</b>	
<b>Contractor Penalties for Failure to Reopen Lanes</b>	
Time All Lanes Reopened ("Verizon" time)	One Lane Closure / Full Closure with Detour
5:00 AM to 5:14 AM	No Penalty
5:15 AM to 5:29 AM	\$2,000
5:30 AM to 5:44 AM	\$2,500
5:45 AM to 5:59 AM	\$3,000
6:00 AM to 6:14 AM	\$4,000
6:15 AM to 6:29 AM	\$5,000
6:30 AM to 6:44 AM	\$6,000
6:45 AM to 6:59 AM	\$8,000
Not Open by 7:00 AM	\$10,000
<b>For every hour, or portion thereof, after 7:00 AM, \$2,000 will be assessed up to a Day Total of \$35,000.</b>	

<b>Southbound SR 1</b>	
<b>Contractor Penalties for Failure to Reopen Lanes</b>	
Time All Lanes Reopened ("Verizon" time)	One Lane Closure / Full Closure with Detour
6:00 AM to 6:14 AM	No Penalty
6:15 AM to 6:29 AM	\$2,000
6:30 AM to 6:44 AM	\$2,500
6:45 AM to 6:59 AM	\$3,000
7:00 AM to 7:14 AM	\$4,000
7:15 AM to 7:29 AM	\$5,000
7:30 AM to 7:44 AM	\$6,000
7:45 AM to 7:59 AM	\$8,000
Not Open by 8:00 AM	\$10,000
<b>For every hour, or portion thereof, after 8:00 AM, \$2,000 will be assessed up to a Day Total of \$35,000.</b>	

Examples of calculations for assessment of Road User Cost:

Failure to have all lanes of traffic open (Two Lane Closure) to I-95 Northbound until 6:12 AM, local time:

A RUC of \$5,000.00 will be assessed.

Failure to have all lanes of traffic open (Three Lane Closure) to I-95 Northbound until 9:10 AM, local time:

7:00 AM through 7:01 AM = \$35,000.00;  
 7:02 AM through 7:59 AM = \$5,000.00;  
 8:00 AM through 8:59 AM = \$5,000.00;  
 9:00 AM through 9:10 AM = \$5,000.00;

A RUC of \$50,000 will be assessed.

Liquidated Damages of \$6,400/calendar day have been established for this project.

Both the Road User Costs and Liquidated Damages will be assessed for each calendar day over the established calendar days proposed in the bid when the contractor's work activities require lane width and shoulder width restrictions. There is no limit on the amount that can be assessed. Assessment of Road User Costs and /or Liquidated Damages will be made by change order.

Liquidated Damages will be assessed for each calendar day over the established calendar days proposed in the bid when the contractor's work activities do not require lane width or shoulder width restrictions. There is no limit on the amount that can be assessed. Assessment of Liquidated Damages will be made by change order.

The Engineer will be the sole approving authority as to when the project is complete after traffic is returned to the ultimate alignment and when the contractors work activities will permit highway traffic ultimate lane width and shoulder widths.

The Contractor is advised that in order to complete the project on or before the number of calendar days proposed in his bid, it may be necessary to provide multiple crews, work overtime and/or weekends and holidays.

CONSTRUCTION PHASING

**If the contractor desires to revise the construction phasing** presented in the contract documents in order to affect the project's completion schedule and base their calendar days on this revision, the contractor must submit an official revised construction phasing plan for the Department's review no later than forty - two (42) calendar days prior to the bid opening. The Department will review the contractor's revised phasing and respond on whether this phasing is acceptable within fourteen (14) calendar days. During this time the Department will determine whether the Contractor's revised proposals for the construction phasing conforms to the project requirements.

After receiving the Department's comments, the contractor has the option to schedule a one-on-one review meeting with the Department within seven (7) calendar days to discuss their proposal and the Department's comments. At that review meeting, documented by a court reporter, all comments and discussion will be held confidential. During the bidding process, all potential ideas presented by the Contractor will be kept confidential. The contractor's revised phasing plan should show in detail the following (but not limited to):

- All appropriate schedule information in order for the Department to make a determination of whether the revised phasing plan is viable.
- A written statement that no additional environmental impacts are incurred due to the phasing changes.

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following:

1. All pertinent provisions and requirements of the prime contract.
2. Description of the work to be performed by the DBE subcontractor.
3. The dollar value of each item of work to be completed by the DBE subcontractor and the bid price of each item of work to be completed by the DBE subcontractor.

\* \* \* \* \*

#### CRITICAL DBE REQUIREMENTS

A bid may be held to be non-responsive and not considered if the required DBE information is not provided. In addition, the bidder may lose its bidding capability on Department projects and such other sanctions as the Department may impose. It is critical that the bidder understands:

1. In the event that the bidder cannot meet the DBE goal as set forth in this specification, he/she shall at the time of bid submit to the Department that percentage of the DBE Goal that will be met, if any, on the written and notarized assurance made a part of this contract. The contractor shall also at the time of bid submit all documentation that the contractor wishes to have the Department consider in determining that the contractor made a Good Faith Effort to meet contract DBE Goals. The Department will not accept Good Faith Effort documentation other than on the scheduled date and time of the bid opening. However, the Department may ask for clarification of information submitted should the need arise.
2. A bid which does not contain either a completely executed DBE Program Assurance and/or Good Faith Effort documentation, where appropriate, shall be declared non-responsive and shall not be considered by the Department.
3. ~~Bidders shall submit with their bid the name, address, age of the firm, and the gross annual receipts of each DBE and non-DBE subcontractor that supplied a quote or a bid to the prime on this project. The Department has attached this document following the Certification document at the end of the Proposal. Failure to submit this information will result in the bid being declared non-responsive and will be rejected.~~
4. Failure of the apparent low bidder to present originals of all DBE subcontracts to substantiate the volume of work to be performed by DBE's as indicated in the bid within ten (10) calendar days after the bid opening shall create a **non-rebuttable** presumption that the bid is not responsive.
5. Bidders are advised that failure to meet DBE Goals during the term of the contract may subject them to Department sanctions as identified in the DBE Program Plan.
6. In the execution of this contract, the successful bidder agrees to comply with the following contract clauses:

**Prompt Payment:** The prime contractor/consultant receiving payments shall, within 30 days of receipt of any payment, file a statement with the Department on a form to be determined by the Department that all subcontractors furnishing labor or material have been paid the full sum due them at the stage of the contract, except any funds withheld under the terms of the contract as required by Chapter 8, Title 17 of the Delaware Code, annotated and as amended. Any delay or postponement of payment from the above referenced time frame may occur only for good cause following written approval of DelDOT. This clause applies to both DBE and non-DBE subcontractors.

**Retainage:** The prime contractor agrees to return retainage to each subcontractor within 15 calendar days after the subcontractor's work is satisfactorily completed. Any delay or postponement of payment from the above referenced time frame may occur only for good cause following written approval of DelDOT. This clause covers both DBE and non-DBE subcontractors. As guidance, once a subcontractor has satisfactorily completed the physical work, and has given to the prime contractor a certified statement that all laborers, lower tier contractors, and materialmen who have furnished labor and materials to the subcontractor have been paid all monies due them, the prime contractor shall return retainage to the subcontractor within 15 calendar days.

7. In the execution of this contract, the successful bidder agrees to comply with the following contract

**STATE OF DELAWARE PREVAILING WAGES**

PREVAILING WAGE DETERMINATION - Highway Construction

Delaware Department of Labor  
Division of Industrial Affairs  
Office of Labor Law Enforcement  
Phone: 302 451-3423

Mailing Address:  
225 Corporate Boulevard  
Suite 104  
Newark, DE 19702

Located at:  
225 Corporate Boulevard  
Suite 104  
Newark, DE 19702

Prevailing Wages for **HIGHWAY CONSTRUCTION** Effective March 15, 2011

<u>Classification</u>	<u>New Castle County</u>	<u>Kent County</u>	<u>Sussex County</u>
Bricklayers	\$44.98	\$44.98	\$14.51
Carpenters	\$40.86	\$48.31	\$38.62
Cement Finishers	\$28.11	\$24.68	\$23.29
Electrical Line Workers	\$22.50	\$54.05	\$54.05
Electricians	\$57.10	\$57.10	\$57.10
Iron workers	\$42.20	\$22.98	\$25.35
Laborers	\$25.44	\$23.33	\$24.00
Millwrights	\$16.11	\$15.63	\$13.49
Painters	\$41.42	\$41.42	\$41.42
Piledrivers	\$59.23	\$23.75	\$26.95
Power Equip. Operators	\$31.46	\$26.00	\$26.31
Sheetmetal Workers	\$22.75	\$20.31	\$18.40
Truck Drivers	\$26.54	\$21.68	\$19.96

CERTIFIED: May 5, 2011

BY: Signature on file

ANTHONY J DELUCA, ADMINISTRATOR  
LABOR LAW ENFORCEMENT SECTION

**NOTICE TO CONTRACTORS**

1. These rates are promulgated and enforced pursuant to the Prevailing Wage Regulations adopted by the Department of Labor on April 3, 1992.
2. 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.
3. Nonregistered apprentices must be paid the mechanic's rate.

**602616 WATERPROOFING PCC MASONRY SURFACES**

**DESCRIPTION:**

Seal concrete surfaces at ends of pier caps as specified in plans using materials, surface preparation, and application of penetrant sealers as specified in this Section and in accordance with the manufacturer recommendations. Perform surface preparation and application to all areas as shown in the plans or as directed by the Engineer.

**PENETRANT SEALERS**

**Materials:**

Use alkylalkoxysilane penetrant sealers, with 40 percent solids and active materials dispersed in water that meet the following:

Table 1: Physical Properties of Penetrant Sealers	
Appearance	White, Milky Liquid
VOC content (EPA method 24)	Less than 350 g/l
Flash Point (ASTM 3278)	Greater than 200°F SETA
Resistance to Chloride ion penetration AASHTO T259 and T260	Less than 0.52 pounds/yd <sup>3</sup> (criteria of 1.5) at 1/2 inch level; 0.00 pounds/yd <sup>3</sup> (criteria of 0.75) at 1 inch level
Water absorption test (ASTM C 642)	0.50 percent maximum / 48 hours; 1.5 percent maximum / 50 days
NCHRP 244	
Series II - cube test	
Water weight gain	85 percent reduction minimum
Absorbed chloride	87 percent reduction minimum
Series IV - Southern climate	
Absorbed chloride	95 percent reduction minimum
Scaling resistance test (ASTM C 672)	(non - air - entrained concrete) 0 rating "No Scaling" (100 cycles)

**SURFACE PREPARATION FOR PENETRANT SEALER:**

**General:**

Prepare concrete surfaces to receive a penetrant sealer in accordance with these Specifications for surfaces of recently cast concrete (new construction).

**Surface Preparation for New Construction:**

Remove substances such as dust, grime, dirt, curing compounds, form oil, debris, etc. by water blasting, light sandblasting, wire brushing, or other methods acceptable to the Engineer, all in accordance with the penetrant sealer manufacturer's recommendations. When using cleaning methods other than water blasting, wash the cleaned surfaces with water meeting the requirements of Section 803, as a final cleaning operation.

**Water for Blasting:**

Use water meeting the requirements of Section 803.

**Concrete Surface Cleaning Operation:**

During the cleaning operation, exercise sufficient care to minimize the removal of the concrete matrix. Furnish hand tools, power grinders, and other similar equipment to remove materials which cannot be removed by water blasting without abrading the concrete matrix beyond acceptable limits. Wash concrete surfaces cleaned by methods other than water blasting with water blasting equipment as the final cleaning operation.

Limit the duration of water blasting to provide a light abraded surface. Do not allow surface abrasion to exceed 0.016 inch. The Engineer will not require further cleaning of stains still apparent after abrading to a depth of 0.016 inch. Avoid exposure of coarse aggregate by water blasting.

Reclean concrete surfaces which become contaminated before applying the penetrant sealer at no expense to the Department prior to applying the penetrant sealer.

**Application of Penetrant Sealer Materials:**

Apply the penetrant sealer only to surfaces which have been prepared in accordance with these Specifications and approved by the Engineer. For application of the penetrant sealer, meet these Specifications and the penetrant sealer manufacturer's recommendations.

Prior to application of any penetrant sealer, cure concrete for a minimum of 21 days.

Apply penetrant sealer no later than ten days after completion of the surface preparation and prior to any contamination of the prepared surfaces as determined by the Engineer.

**Application Equipment:**

Apply the penetrant sealer using any suitable air or airless sprayer with an operating pressure of approximately 20 psi.

**Application Limitations:**

Apply the penetrant sealer material only when the ambient air temperature is between 50 and 90°F. Apply the penetrant sealer only to concrete surfaces which have dried a minimum of 48 hours after water last contacted the concrete surfaces. Do not apply the penetrant sealer when winds are blowing 25 mph or more, during rainfall, or when water spray or mist is present.

**Application:**

Apply the penetrant sealer only to concrete surfaces that have been prepared in accordance with the requirements and limitations set forth in these Specifications. Determine the actual coverage rate in square feet per gallon on the basis of field trials. Conduct a field trial to determine coverage rate at the beginning of any penetrant sealer application operation. For each field trial, determine the optimum coverage rate for 50 ft<sup>2</sup> of surface area. Maintain the penetrant sealer application rate between 155 and 225 ft<sup>2</sup> covered per gallon of penetrant sealer used. Apply the penetrant sealer in a uniform manner without puddling and skips. Redistribute any penetrant sealer which is applied and subsequently puddles in low areas over the concrete surfaces by use of a squeegee. Generally, begin the application of the penetrant at the lowest elevation and proceed upward toward higher elevations.

Maintain operating pressures in the sprayers used for application of the penetrant sealer material sufficiently low so that atomization or misting of the material does not occur.

### **CONTROL OF MATERIALS:**

#### **Packaging and Identification:**

Deliver the penetrant sealer to the project in unopened, sealed containers with the manufacturer's label identifying the product and with numbered seals intact. Ensure that each container is clearly marked by the manufacturer with the following information:

- a. Manufacturer's name and address.
- b. Product name.
- c. Date of manufacture.
- d. Expiration date.
- e. LOT identification number.
- f. Container serial number.

#### **Manufacturer's Certification:**

Provide the Engineer a certification from the manufacturer, confirming that the penetrant sealer meets the requirements of this Section. Do not incorporate these materials into the project until the Engineer has accepted and approved the certification for the material. Submit such certification for each LOT of material delivered to the project. In each certification, identify the serial or LOT numbers of the containers certified.

#### **Materials Sampling for Tests:**

The Engineer may require samples from each LOT or container of materials delivered to the project or from containers at the point of use. When samples are required, furnish samples in accordance with the Engineer's instructions.

#### **Storage of Materials:**

Store materials delivered to the job site in original unopened containers within an appropriate storage facility. Use a storage facility that provides protection from the elements, and safe and secure storage of the materials.

#### **Unused Material in Opened Containers:**

Do not return unused material in opened containers to storage for later use. Either apply such material to appropriate areas on concrete surfaces or remove and dispose of it at offsite locations provided by the Contractor.

#### **Acceptance:**

The Engineer will accept penetrant sealer application when it is determined that the Contractor has properly cleaned all surface areas to be sealed and has applied the penetrant sealer within the required rates of application.

**MEASUREMENT AND PAYMENT**

The preparation, cleaning, testing, certifications, field trials, furnishing, and applying of the concrete sealer on the various ends of pier caps will not be measured but the cost will be incidental to the pertinent "Portland Cement Concrete Masonry" item. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

3/11/11

**602772 - MECHANICALLY STABILIZED EARTH WALLS****Description:**

This work shall consist of the design and construction of mechanically stabilized earth (M.S.E.) retaining walls in accordance with the AASHTO definitions of mechanically stabilized earth walls employing tensile reinforcements in the soil mass. The M.S.E. retaining wall shall be constructed in conformance with these specifications and to the lines, grades, and dimensions shown on the Plans or as established by the Engineer. Design details for these structures shall be as submitted for approval.

The M.S.E. retaining wall shall be designed in conformance with the 2007 AASHTO LRFD Bridge Design Specifications, 4<sup>th</sup> Edition including all current Interims and the requirements specified on the Plans.

The following additional specific design requirements shall be met by the developed plans:

- a. All retaining wall components shall be designed for a minimum service life of 100 years.
- b. Completed walls shall have a concrete facing with a finish or aesthetic treatment as approved by the Engineer.

**Design Requirements:**

The design of the internal stability of the MSE wall shall be the responsibility of the wall manufacturer. Design constraints imposed by external (overall) stability, such as allowable bearing pressure due to the combined effects of vertical and lateral loads, minimum length of reinforcing elements, as set forth herein, shall be the responsibility of the Contractor.

Working drawings bearing the fabricator's or supplier's title block and design calculations sealed by a professional engineer registered in the State of Delaware shall be submitted for review and approval by the Engineer at least 4 weeks before work is to begin. Working drawings and design calculations shall include the following:

- (a) Existing ground elevations that have been verified by the Contractor for each location involving construction wholly or partially in original ground.
- (b) Layout of wall that will effectively retain the earth but not less in height or length than that shown for the wall system in the Plans.
- (c) Complete design calculations substantiating that the proposed design satisfies the design parameters in the Plans and in the special provisions.
- (d) Complete details of all elements required for the proper construction of the system, including complete material specifications.

No work or ordering of materials shall commence until approval of the working drawings has been given by the Engineer. Acceptance of the Contractor's working drawings shall not relieve the Contractor of his responsibility under the contract for the successful completion of the work. All work pertaining to Working Drawings for MSE retaining walls shall be done at no additional cost to the Department.

*Internal Stability:* The internal stability of a mechanically stabilized earth structure shall be the responsibility of the wall supplier. Internal stability issues include, but are not limited to, pullout (or

geotechnical) failure of the soil reinforcing elements, tensile failure of the soil reinforcing elements, failure of panel/reinforcement connections, failure through the backfill material within the reinforced mass, and failure along a reinforcing element surface within the reinforced soil mass.

Sliding, overturning, and bearing capacity shall be evaluated by the wall supplier. The allowable bearing capacity at the MSE walls shall be determined by the Contractor and submitted for approval by the Engineer.

*Failure Plane:* The so-called failure plane shall be taken as coincident with the locus of the points of maximum tensile force which separates the reinforced mass into an active zone between the face of the wall and the line of maximum tensile forces, and a resistant zone behind the maximum tensile forces line. The location of the so-called failure plane shall be adjusted, where necessary, to account for the effects of significant externally applied loads, such as those due to a bridge abutment footing supported directly on the mechanically stabilized backfill.

*Resistance Factors for Permanent MSE Walls:*

0.9 for pullout of tensile reinforcing elements.

1.0 for sliding of the reinforced soil mass along the interface between the reinforced mass and the underlying native soil. The passive resistance of the soil in front of the embedded portion of the wall shall not be included in evaluating lateral stability of the reinforced mass.

0.75 for failure at the facing panel/reinforcing element connection based on the maximum allowable reinforcement tension at the end of the design service life.

*Panel/Reinforcement Connections:* All connections shall be positive structural connections subject to the galvanizing and metal loss rates, for metal reinforcing elements, and allowable tensile stresses given in Stresses in Reinforcing Elements. The structural adequacy and pullout capacity of the connections shall be demonstrated by test data from pullout and flexural tests on full size panels in which all connections are loaded simultaneously. The test data shall be provided by the manufacturer.

*Drainage:* Drainage shall be as designed by the Contractor or as directed by the Engineer. Internal and external drainage shall be evaluated for all structures to prevent saturation of the backfill or to intercept any surface flows containing aggressive elements such as de-icing salts. Internal drainage of the mechanically stabilized backfill shall be considered where the anticipated rate of surface infiltration due to precipitation exceeds the vertical permeability of the backfill material.

*Length of Reinforcing Elements:* The length of the reinforcing elements shall be constant over the entire height of any wall section. The minimum reinforcement length shall be as shown on the Plans and not less than eight (8) feet in accordance with AASHTO. In addition, the length of the reinforcing elements shall be sufficient to satisfy all the design criteria with respect to both internal and external stability.

*Stresses in Reinforcing Elements:* The reinforcing elements shall be designed to have a minimum design life of 100 years with all material and other resistance factors intact at the end of the design life of the mechanically stabilized earth structure.

Unless otherwise indicated by the Engineer, the following metal loss rates shall be used in determining the useful area of metal soil reinforcement remaining at the end of the nominal service life:

Loss of Galvanizing (first 2 years):	0.58 mil./year
Loss of Galvanizing (2 years - depletion):	0.16 mil./year

Carbon steel (after zinc depletion): 0.47 mil./year

The allowable tensile stress in the longitudinal wires of the mesh reinforcing elements shall not exceed fifty-five (55) percent of the nominal yield stress of the steel, provided that the yield stress does not exceed 65 kips/sq.in. The maximum tension in any reinforcing element shall not exceed the product of the maximum allowable tensile stress and the area of steel remaining at the end of the nominal service life.

*Stresses at Panel/Reinforcement Connections.* The horizontal earth pressure used to design the connections and facing panels shall be equal to the maximum horizontal stress computed at each reinforcement level, but in no case shall it be less than eighty-five (85) percent of the maximum horizontal pressure. In the case of rigid panel/reinforcement connections the allowable stress in the reinforcement at the connection shall be reduced to allow for bending stresses induced in the connection due to relative vertical movement between the facing panels and the reinforced backfill.

*Internal Horizontal Stresses:* For MSE wall systems with quasi-inextensible reinforcing elements, the horizontal stress at each reinforcement level shall be computed by multiplying the corresponding vertical stress by an earth pressure coefficient, K. The vertical stress shall be computed using a layer-by-layer approach following Meyerhof's analysis for eccentrically loaded footings; i.e., the resulting vertical stress at any reinforcement level is a function of the vertical stress due to the self weight of the overlying backfill material and the increase in vertical stress due to the overturning effects of the lateral load from the random fill retained by the mass of reinforced backfill.

The value of the earth pressure coefficient, K, shall be assumed equal to the at-rest ( $K_o$ ) value at the top of the wall decreasing linearly to the Rankine active value ( $K_a$ ) at a depth of 20 feet. At depths in excess of 20 feet, the value of K shall be taken as  $K_a$ . For normally consolidated soils,  $K_o = 1 - \sin\phi$ , where  $\phi$  is the angle of shearing resistance of the backfill material. For typical values of  $\phi$ ,  $K_o$  may be assumed equal to  $1.5K_a$ .

*Pullout Resistance (Anchorage) Factors:* Non-dimensional anchorage factors (denoted as  $A_c$ ) as determined by laboratory or field pullout tests on reinforcing elements shall be based on the interpreted failure load at a maximum displacement of three-quarters (3/4) of an inch. The anchorage factor,  $A_c$ , shall be computed from the expression

$$A_c = \frac{\text{Load at 3/4-inch displacement}}{p_v d b N}$$

where  $p_v$  = vertical stress (due to self weight of backfill only) at the reinforcement level,  $d$  = diameter of transverse wires,  $b$  = width of transverse wires for a 6-inch spacing of longitudinal wires,  $N$  = number of transverse wires.

The spacing between transverse wires shall not be less than six (6) inches. The non-dimensional anchorage factor shall be assumed to decrease linearly from 40 at the top of the wall to 15 at a depth of 20 feet. At depths greater than 20 feet the anchorage factor shall be taken equal to 15.

### **Architectural Treatment**

All walls shall have the same shape and sized panels except as necessary to maintain grade and length. All panels shall have a cruciform shape with each panel nominal size (out-to-out of cruciform) of approximately 5' by 5'. The color of the concrete panels shall match the adjacent concrete structures.

A pilaster made of individual panels, approximately 5' high x 4' wide, shall be placed at each abutment corner and then at equal intervals along the wall (approximately 90' intervals). The abutment corner shall split the

panel evenly. The pilaster panel shall be flush with the remaining wall.

All panels shall have a smooth float finish in accordance with Section 602.17.d. The contractor shall submit sample drawings of a typical wall elevation along with details of the typical and pilaster panel and may be required to produce a sample panels before panel fabrication can begin.

**Materials:**

The Contractor shall make arrangements to purchase or manufacture the concrete facing panels, reinforcing mesh or strips, attachment devices, and all other necessary components. Materials not conforming to this section of the specifications shall not be used without written consent from the Engineer.

*Steel Reinforcing Mesh.* Reinforcing mesh shall be shop fabricated of cold drawn steel wire conforming to the minimum requirements of A 82 and shall be welded into the finished mesh fabric in accordance with A 185. Galvanization shall be applied after the mesh is fabricated and conform to the minimum requirements of A 123.

*Steel Reinforcing Strips.* Reinforcing strips shall conform to the physical and mechanical properties of ASTM A 572, Grade 65 steel. Galvanizing shall conform to the minimum requirements of AASHTO M111 (ASTM A 123).

*Steel Connectors.* Connectors shall be fabricated from cold drawn steel wire conforming to the minimum requirements of A 82. Pins shall be fabricated from A 36 steel. Connectors and pins shall be galvanized to conform to the minimum requirements of A 123.

*Filter Fabric.* Where required by design, filter fabric shall be placed behind the facing units. Filter fabric shall be woven polypropylene fabric, meeting the requirements of M 288 for a Class I geotextile having an Ultraviolet Stability of 70% strength retention after 500 hours as tested by D 4355. Slit film geotextile shall not be allowed.

*Backfill.* Multiple types of backfill are required for the construction of the MSE walls. All backfill material used in the structure volume shall be reasonably free from organic or otherwise deleterious materials and shall be as specified on the plans. Placement limits are shown on the plans. The material requirements for each backfill type are as follows:

Select Backfill. Select backfill shall conform to the following gradation limits as determined by AASHTO T-27 (ASTM D-422):

Reinforced Backfill	
Sieve Size	Percent Passing
4 inches	100
No. 40	0-60
No. 200	0-15

In addition, the select backfill material shall conform to the following requirements:

- a) Plasticity Index: The Plasticity Index (P.I.), as determined by AASHTO T- 90 (ASTM D-4318), shall not exceed 6.

b) The material shall be substantially free of shale or other soft, poor durability particles. Testing in accordance with AASHTO T-104 shall be performed to verify a magnesium sulfate soundness loss of less than 30% after four cycles.

c) Electrochemical Requirements - The backfill materials shall meet the following criteria:

<u>Requirements</u>	<u>Test Methods</u>
Resistivity >3,000 ohm-cm	AASHTO T-288-91
pH 5-10	AASHTO T-289-91
Chlorides <100 parts per million	AASHTO T-291-91
Sulfates <200 parts per million	AASHTO T-290-91
Organic Content <1%	AASHTO T-267-86

If the resistivity is greater or equal to 5000 ohm-cm, the chloride and sulfates requirements may be waived.

DelDOT No. 57 Stone. Free draining stone conforming to DelDOT No. 57 stone or approved equal shall be placed to an elevation as specified in the plans of the MSE embankment.

The Contractor shall furnish to the Engineer a Certificate of Compliance certifying that the backfill materials comply with this section of the specifications prior to backfill placement. A copy of all test results performed by the Contractor, which are necessary to assure compliance with the specifications, shall also be furnished to the Engineer. Backfill not conforming to this specification shall not be used without the written consent of both the Engineer and the wall supplier.

*Concrete:* Concrete for the facing, leveling pad, moment slab and barrier shall conform to the requirements of Section 602 of the Specifications.

**Construction Methods:**

The selected MSE wall manufacturer shall provide a representative on site at the outset of the wall construction and periodically throughout construction of the wall and at the direction of the Engineer. The wall manufacturer’s representative shall be present at a pre-construction conference to provide an overview of the wall system and a detailed construction procedure to the contractor and the Engineer.

*Wall Excavation.* Excavation shall be in accordance with the requirements of the general specifications and in reasonably close conformity with the limits shown on the Plans. Temporary excavation support as required shall be the responsibility of the Contractor. The base of the excavation shall be completed to within +/- 3 inches of the staked elevations unless otherwise directed by the Engineer.

*Foundation Preparation.* The foundation for the structure shall be graded level for a width 1 foot beyond the length of the reinforcement elements or as shown on the Plans. Prior to wall construction, the foundation shall be proofrolled under the observation of the Engineer. Any unsuitable foundation material as determined by the Engineer shall be excavated to the determined depth and replaced with Borrow Type B and shall be compacted in accordance with Backfill Placement as described below.

At each panel foundation level, a precast reinforced or a cast-in-place unreinforced concrete leveling pad of the type shown on the plans shall be provided. The leveling pad shall be cured a minimum of 12 hours before placement of wall panels.

*Wall Erection.* The wall system components shall be constructed in accordance with the wall system

supplier's recommendations and construction manual. The wall shall be constructed vertical and within the specified tolerances. The overall vertical tolerance of the wall and the horizontal alignment tolerance shall not exceed 3/4-inch per 10 feet. Bulging in the vertical or horizontal direction shall be limited to 2 inches as measured from the theoretical wall line. The Engineer shall be notified of any bulging areas that exceed this limit.

*Backfill Placement.* Backfill placement shall closely follow erection of each course of concrete facing units. Backfill shall be placed in such a manner as to avoid any damage or disturbance to the wall materials or misalignment of the facing. Any wall materials that become damaged or disturbed during backfill placement shall be removed and replaced at the Contractor's expense or corrected as directed by the Engineer. The Engineer will be the sole authority as to the acceptability of any repairs to damaged wall materials. Any misalignment or distortion of the wall elements due to placement of backfill outside the limits of this specification shall be corrected as directed by the Engineer.

Backfill within the zone of soil reinforcements shall be compacted to 95% maximum dry density and optimum moisture content, as determined by AASHTO T 99, by at least four (4) passes of a heavy roller having a minimum dynamic force of 20 tons impact per vibration and a minimum frequency of 16 hertz.

The moisture content of the backfill material prior to and during compaction shall be uniformly distributed throughout each layer. The water content of the wall backfill shall not deviate from the optimum water content by more than 2%. Backfill material with a placement moisture content in excess of the optimum moisture content shall be removed and reworked until the moisture content is uniformly acceptable throughout the entire lift.

The maximum lift thickness after compaction shall not exceed 10 inches regardless of the vertical spacing between layers of soil reinforcements. The Contractor shall decrease this lift thickness as required to obtain the specified density.

Prior to placement of the soil reinforcements, the backfill elevation after compaction within the zone of soil reinforcements shall be 2 inches above the connection elevation from a point approximately 24 inches behind the facing to the free end of the soil reinforcements unless otherwise shown on the Plans.

Compaction within 3 feet of the facing shall be achieved by at least three (3) passes of a lightweight mechanical tamper, roller or vibratory system. Care shall be exercised in the compaction process to avoid misalignment of the facing. Heavy compaction equipment shall not be used to compact backfill within 3 feet of the wall face. At the end of each day's operation, the Contractor shall slope the last level of backfill away from the wall facing to direct runoff of rainwater away from the wall face. In addition, the Contractor shall not allow surface runoff from adjacent areas to enter the wall construction site.

*Leveling Pad.* The concrete leveling pad at the concrete facing shall be unreinforced and constructed to the elevation and width shown on the Plans. The leveling pad shall be constructed on compacted, drained subgrade.

*Utilities.* The contractor shall accommodate the passage of utilities through the reinforced embankment material. The soil reinforcements shall be placed to permit the installation and operation of, and access to, the utilities constructed within the embankment while satisfying the design requirements of the MSE wall. The MSE wall manufacturer shall provide a construction sequence for installation of utilities within the reinforced embankment which does not jeopardize the integrity and stability of the reinforced soil mass.

*Moment Slab and Barrier.* The moment slab and barrier shall be constructed according to the details shown on the plans.

*Toe protection.* The toe of the wall shall be embedded in accordance with the Plans and shall be protected as required for the life of the structure to avoid undermining the wall face.

**Method of Measurement:**

MSE Wall design and construction including all material, labor, equipment, expendables, etc., incidental to their installation and testing, will not be measured but will be paid for at the Contract lump sum price for pertinent Retaining Wall or Abutment items. All excavations required for the construction of the MSE Wall will not be measured and will be incidental to the construction of the pertinent Retaining Wall or Abutment items. Temporary excavation support as required will not be measured and will be incidental to the construction of the pertinent Retaining Wall or Abutment items. All backfill material behind the MSE Wall which is not Type F borrow and as shown on the MSE Wall plans, will not be measured and will be incidental to the construction of the pertinent Retaining Wall or Abutment items. Excavation of unsuitable material will be paid for under Item 212000 undercut excavation and backfilling with Borrow Type B will be paid for under Item 209002.

The concrete and reinforcement for the moment slab and barrier and coping will be measured separately and will be paid for as a separate item. The concrete leveling pad is included in this pay item.

**Basis of Payment:**

The payment will be full compensation for all components of the MSE Wall and shall include full compensation for designing, fabricating, furnishing, installing and for all materials, labor, tools, equipment, and incidentals necessary to complete the installation in conformance with the plans and Specifications. In the event that an increase or decrease in the area of the wall elevation is required, the increase or decrease in the lump sum bid shall equal the increased or decreased area multiplied by the lump sum price divided by the original elevation area. The "original elevation area" shall include the below-grade area of the concrete fascia.

Retaining Walls will not be measured but will be paid for at the Contract Lump Sum price for the pertinent Retaining Wall or Abutment items.

**NOTE:**

A breakout sheet attached to the Proposal list the walls under this item. The Contractor shall fill in a unit price for each item and the cost (unit price times the proposed quantity). The lump sum bid for Item 602772 - Mechanically Stabilized Earth Walls shall be the sum of the cost for all items listed. The breakout sheet shall be attached to the Bid Proposal. Failure to submit the breakout sheet with the Bid Proposal will result in the Bid Proposal being declared non-responsive and rejected.

The Department reserves the right to delete from the Contract one or more of the items listed and right to add or subtract from the quantity of each item. The lump sum to be paid will be adjusted in accordance with the Contractor's unit prices as required above. There will be no extra compensation if such additions and/or deletions are made.

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**602774 - MASONRY FOR LIGHT POLE FOUNDATION (CY)****Description:**

This work shall consist of all labor, materials, equipment, and services necessary to perform all operations to complete the installation of drilled shafts for light poles. The work shall be completed in accordance with the plans, Delaware Department of Transportation's Specifications for Road and Bridge Construction dated August 2001 (Standard Specifications), and this Special Provision. The work involves installing constant-diameter drilled shafts through Coastal Plain sediments and Piedmont Residuum. High water tables may be present.

**Materials:**

Materials shall meet the following requirements:

a. Portland Cement Concrete

Portland cement concrete shall be 4500-psi minimum (Class A) and shall meet the requirements specified in Section 602 and 812, in the Delaware Department of Transportation's Specifications for Road and Bridge Construction (August 2001). Where not otherwise specified, ACI 336.1-94 shall be followed. Water used in mixing concrete shall conform to Section 803 of the Standard Specifications.

Concrete shall remain workable and maintain a 4-inch slump for up to four hours after placing. If free fall methods are utilized for placement, the maximum coarse aggregate size shall be reduced to 3/8-inch. A slump value range of 5 ±1-inch shall be provided for all uncased holes and a slump range of 6 ±1.5-inch shall be provided for cased holes. A minimum slump of 6-inch with the addition of a retarder is required when a casing is being withdrawn. An acceptable water reducing and retarding admixture shall be added to the concrete to produce the specified slump. Under no circumstances shall the admixture cause segregation of the concrete. If any admixtures are added to the concrete at the site, the admixture must be added to the concrete by a qualified Contractor-furnished technician. Immediately after the addition of the admixture, the drum shall be turned a minimum of thirty revolutions, at mixing speed, until the concrete is thoroughly mixed. The technician shall then test the slump and consistency of the concrete mixture. Under no circumstances shall the Contractor add additional water to the concrete mixture to reach the desired slump.

b. Reinforcing Steel

Deformed reinforcing bars shall be in accordance with the sizes, spacing, dimensions, and details shown on the plans and shall conform to AASHTO M31, Grade 60, and the requirements of Section 603 and 604 of the Specifications.

c. Casing

Casing shall be metal, smooth, clean, watertight, and of ample strength to withstand both handling and driving stresses and the pressure of both concrete and the surrounding earth materials. Thickness of the casings shall not be less than 0.25-inch. The inside diameter of casing shall not be less than the specified size of the shaft. No extra compensation will be allowed for concrete required to fill an oversized casing or oversized excavation. All casings shall be removed from shaft excavations. Permanent steel casings shall not be used.

d. Slurry

Use of slurry shall not be permitted.

e. Ground Rod and Clamp

Ground rods shall be copper clad, approved by the Underwriter's Laboratory, and be supplied with approved clamps for connecting the grounding conductor to the rod. Ground rods shall be 3/4 inch diameter by 10 foot, sectional, unless otherwise specified on the Plans.

## f. Conduit sweeps

Conduit sweeps shall meet the requirements for galvanized steel rigid conduit in Section 745 of the Delaware Department of Transportation's Specifications for Road and Bridge Construction (August 2001).

## g. Anchor Bolts

Anchor bolts will be supplied by the same entity that supplies the poles. Anchor bolts shall have a minimum yield strength of 55,000 psi.

**Contractor Qualification:**

This work shall be performed under the supervision of the Contractor's superintendent, who will be fully knowledgeable and experienced, as defined herein, in the construction of drilled shaft foundations of similar sized shafts and geotechnical conditions using both cased and slurry methods. Further, the Contractor and the Contractor's superintendent performing the work shall document at least five years previous experience within the last eight years constructing drilled shafts, with at least two years at the current firm. The Contractor's equipment shall have the capacity to undertake the work and shall be sufficient to complete the work within the specified contract time.

The Contractor shall provide documentation of his qualifications, experience record, prior project references, and the availability of the equipment needed to perform the required work. All prior project references shall be currently available personnel who can verify the quality of the contractor's previous work and shall include current name, address, and telephone number. This documentation shall reference the experience of the drilled shaft Contractor and the drilled shaft Contractor's superintendent in responsible charge of the drilled shaft operations. This documentation shall reference successful construction of similar sized shafts in the following conditions:

- a. Experience in successfully installing drilled shafts of the size shown in the plans. The minimum experience shall consist of ten similar-sized projects in the past five years. Descriptions of projects must include a point of contact with the owner that is familiar with the project.
- b. Experience in cleaning shaft bottoms when working under wet conditions.

**Equipment:**

The Contractor shall furnish all equipment and instrumentation necessary for installation of the shafts.

The excavation and drilling equipment shall have adequate capacity including power, torque, and down thrust to excavate a hole of the maximum diameter shown on the plans and to a depth of 15-feet or 20 percent beyond the depths shown in the contract documents, whichever is greater.

The excavation and tools shall be of adequate design, size, and strength to perform the work shown in the contract documents or described herein. When the material encountered cannot be drilled using conventional earth augers with soil or rock teeth, drilling buckets, and/or over-reaming tools, the Contractor shall provide special drilling equipment including but not limited to: rock core barrels, rock tools, air tools, blasting materials, and other equipment as necessary to construct the shaft excavation to the size and depth required.

Provide a descriptive listing of available equipment that is fully capable of cleaning shaft bottoms when shafts are excavated under wet conditions.

**Site Information:**

Test Boring Log sheets are included in the contract documents for use by the Contractor. Data on subsurface conditions is not intended as representations or warranties of continuity of such conditions. It is expressly understood that the Department will not be responsible for interpretations or conclusions drawn therefrom by the Contractor. The data is made available for the convenience of the Contractor. The Contractor may make additional test borings and other exploratory operations at no additional cost to the Department.

Two geotechnical engineering reports titled Final Foundations Report – Bridge and Associated Wingwalls, dated April, 2009 and the Final Foundations Report – Retaining Walls, dated April 2009, for the SR1/I-95 Interchange Improvements have been prepared for this project by Rummel, Klepper, and Kahl, LLP (RK&K) and URS Corporation (URS). These reports were prepared to establish design guidelines only and should not be considered part of the contract documents nor as a warranty of subsurface conditions. These reports may not be sufficient for use by specialty contractors. Contractors or prospective bidders may contact the Delaware Department of Transportation to review a copy of these reports.

**Submittals:**

The Contractor shall submit to the Engineer for review and approval, an installation plan for the construction of drilled shafts not less than thirty days before the start of work as detailed in this Special Provision. The submittal shall include at least the following:

- a. List of proposed equipment to be used including cranes, drills, augers, bailing buckets, final cleaning equipment, tremie or concrete pumps, casing, and other appurtenances.
- b. Details of overall construction operation sequence and the sequence of shaft construction in bents or groups, including scaled plan and profile showing the location, size and movements of equipment setup and operations. The completion of any required integrity and loading tests shall be noted in this construction operation sequence.
- c. Submit project experience and resumes in accordance with Contractor Qualification.
- d. Details of shaft excavation and stabilization methods.
- e. Method of monitoring verticality of the shaft excavation during excavation and details of proposed corrective measures to be implemented as necessary.
- f. Very specific details of methods to clean the shaft excavation. Details shall include at least three alternative bottom cleaning methods with descriptions of equipment to be used when installing drilled shafts with wet methods. Include details of method for identifying type of bearing material for consistency with design assumptions prior to placement of concrete.
- g. Details of reinforcement placement including support and centralization methods.
- h. The concrete mix design, including admixtures to be used. Details of concrete placement, curing, and protection.
- i. A copy of the proposed report format for planned shaft inspections. Record information for each shaft and details of any required load or integrity tests.
- j. Other information shown on the plans or requested by the Engineer.

The Contractor will not be permitted to start construction of any drilled shaft, until the complete installation plan submittal as described above has been received, reviewed and written approval to begin construction has been issued by the Engineer.

The Contractor will not be permitted to start the construction of drilled shafts for which working drawings are required until the Engineer has approved such drawings. Such approval will not relieve the Contractor of responsibility for results obtained by the use of these drawings or any of his other responsibilities under the contract.

Submittals during construction shall include record information for each shaft and details of any required loading or integrity tests as required.

**Construction Methods:**

## a. Protection of Existing Structures

All reasonable precautions shall be taken to prevent damage to all existing structures, utilities, and the public. These measures shall include but are not limited to, selecting construction methods and procedures that will prevent excessive caving of the shaft excavation, monitoring, and controlling the vibrations from the driving of casing or sheeting, drilling of the shaft, or from blasting, if permitted. The Contractor shall verify that there are no subsurface utilities in close proximity of each shaft before beginning excavation activities.

## b. Construction Sequence

Where drilled shafts are to be installed in conjunction with embankment placement, they shall be constructed after the placement of the fill.

Excavation of adjacent drilled shafts or other structures or utilities within a radius of three shaft diameters will not be permitted until concrete has been in place for at least 48 hours.

## c. Methods of Construction

Excavations required for shafts shall be performed through whatever materials are encountered, to the dimensions and elevations shown on the plans or otherwise required by the Standard Specifications and Special Provisions. The method used shall be suitable for the intended purpose and materials encountered. The dry method or temporary casing method will be used as necessary to produce sound, durable concrete foundation shafts that are free of any defects. Wet method may only be used after the Engineers approval. When a particular method of construction is required in the contract documents, that method shall be used. If no particular method is specified for use, the Contractor shall select and use the method, as determined by site conditions, subject to approval of the Engineer, which is needed to properly accomplish the work.

The estimated lengths shown on the plans and in the geotechnical reports should be considered approximate. Additional shaft lengths might be required depending on actual subsurface conditions. Shorter shaft lengths than indicated on the plans may only be constructed with the written approval of the Engineer.

## 1. Dry Construction Method

The dry construction method shall be used only at sites where the ground-water table and site conditions are suitable to permit construction of the shaft in a relatively dry excavation (i.e., less than 3-inch of water accumulates above the final base elevation over a one-hour period when no pumping is permitted), and where the sides and bottom of the shaft are stable and may be visually inspected prior to placing the concrete.

The dry method consists of drilling the shaft excavation, removing accumulated water and loose material from the excavation, placing temporary casing, inspecting the bearing stratum, removing temporary casing, placing the reinforcing steel if required, and placing the shaft concrete in a relatively dry excavation. If caving occurs or if there is excess seepage into the drilled shaft, the drilling should be continued using a casing to maintain the integrity of the hole. Concrete shall be placed in accordance with Section VII.I.

## 2. Wet Construction Method

The wet construction method shall not be used.

## 3. Temporary Casing Construction Method

The temporary casing construction method shall be used at all sites where excessive caving or seepage could occur. When a nearly impervious formation is reached, a temporary casing shall be placed in the hole and sealed in the nearly impervious formation. As an alternative to use of the wet excavation method, temporary casing may be installed by drilling, driving, or vibratory procedures in advance of excavation to the lower limits of the caving material. Slurry may not be used. Significant caving

shall be considered to be more than 50% increased volume over theoretical shaft volume, for a section exceeding 10-feet of shaft. Casing shall be installed to the final base elevation to allow inspection of the bearing stratum.

After the reinforcing steel cage has been placed, fill the excavation with concrete. Before the casing is withdrawn and while the casing is being withdrawn, the level of fresh concrete in the casing shall be at such a level that all the fluid trapped behind the casing is displaced upward without contaminating the shaft concrete. Placement of the concrete and pulling of the temporary casing shall be conducted in accordance with Sections VII.I and VII.J of this Special Provision.

#### 4. Alternative Construction Methods

The Contractor may propose alternative methods to prevent caving and control ground water. Such proposals, accompanied by supporting technical data, shall be submitted in accordance with Section VI, Submittals. Written approval from the Engineer is required before the use of alternative construction methods.

#### d. Excavations

The bottom elevation of drilled shafts shown on the plans may be adjusted during construction if the Engineer determines that the foundation material encountered during excavation is unsuitable or differs from that anticipated in the design of the drilled shaft. The Contractor shall take soil samples when shown on the plans or as directed by the Engineer to determine the character of the material directly below the shaft excavation. The Engineer will inspect the samples or cores and determine the final depth of required shaft excavation.

The Contractor shall maintain a construction method log during shaft excavation. The log shall contain information such as the description and approximate top and bottom elevation of each soil or rock material, seepage or groundwater, and remarks.

Excavated materials, which are removed from the shaft excavation and any drilling fluids used, shall be disposed of off site in accordance with local environmental regulations and the contract documents or as directed by the Engineer.

#### 1. Unclassified Excavation

Drilled shaft excavation is designated as unclassified; the Contractor shall provide the necessary equipment to remove and dispose of any materials encountered in forming the drilled shaft excavation to the dimensions shown on the plans or as directed by the Engineer. No separate payment will be made for excavation of materials of different densities and character.

The Contractor shall provide tools such as augers fitted with either soil or rock teeth, and drilling buckets attached to drilling equipment of the size, power, torque, and down thrust approved for use by the Engineer. Material normally classified as decomposed rock, weathered, rock, disintegrated rock, or rock shall be considered as unclassified excavation. The Contractor shall provide appropriate tools such as, but not limited to, equipment listed in Section IV of these provisions in order to install the drilled shafts to their design depths.

#### e. Obstructions

The Contractor shall remove surface and subsurface obstructions at drilled shaft locations. Such obstructions may include man-made materials, such as old concrete foundations, and natural materials, such as boulders. Boulders are defined as stones with a least dimension greater than 1-foot. Special tools and/or procedures shall be employed by the Contractor after the hole cannot be advanced more than 1-foot in thirty minutes using approved equipment operating at maximum power, torque, and down thrust, using conventional augers fitted with soil or rock teeth, drilling buckets, and/or under-reaming tools. Such special procedures/tools may include but are not limited to: chisels, boulder breakers, core barrels, air tools, hand excavation, temporary casing, and increasing hole diameter. Blasting shall not be permitted unless specifically approved in writing by the

Engineer.

f. Lost Tools

Drilling tools that are lost in the excavation shall not be considered obstructions and shall be promptly removed by the Contractor without compensation. All costs due to lost tool removal shall be borne by the Contractor including but not limited to costs associated with hole degradation due to removal operations or the time the hole remains open.

g. Excavation Inspection

The Contractor shall provide details of shaft construction to the Engineer for review. The Contractor shall provide equipment for checking the dimensions and alignment of each shaft excavation. The Contractor shall determine the shaft dimensions and alignment under the observation and/or direction of the Engineer. Final shaft depth shall be measured after final cleaning.

Shaft cleanliness and the bearing surface condition will be evaluated and approved by the Engineer. The Contractor shall provide safe access and egress to the Engineer for inspection of the bottom of the excavation prior to placement of reinforcing steel and concrete. After the Contractor has prepared the bottom of the shaft excavation, the Contractor shall notify the Engineer. The Contractor shall coordinate schedules for excavation inspection by the Engineer.

The Contractor shall not permit any worker to enter the shaft excavation for any reason unless: both a suitable casing has been installed and the water level has been lowered and stabilized below the level to be occupied, and adequate safety equipment and procedures have been provided to workers entering the excavation. The Contractor shall follow OSHA guidelines for confined space entry.

Prior to placement of reinforcing steel and concrete, the Contractor shall ensure that loose material from the bottom and sides of excavation have been removed and that shaft is within the specified tolerances. Specified tolerances are listed in Section VII.K of this Special Provision. The shaft excavation shall be cleaned to remove all accumulated sediment and water.

The Contractor shall be responsible for correcting drilled shafts that are not constructed within the specified tolerances. Remedial measures, including engineering analysis and redesign, to correct for out-of-tolerance drilled shaft foundations, shall be performed at no additional cost to the Department.

h. Reinforcing Steel Cage Construction and Placement

The reinforcing steel cage consisting of the steel shown on the plans plus cage stiffener bars, spacers, centralizers, and other necessary appurtenances shall be completely assembled and placed as a unit immediately after the shaft excavation is inspected and accepted and prior to shaft concrete placement. Prior to installation of the steel cage in the shaft excavation, inspect and clean the reinforcing steel of materials that prevent effective bonding. Clear spacing between bars of the rebar cage shall be at least five times the size of the maximum coarse aggregate. Hooks at the top of the rebar cage shall not be bent outward if temporary casing will be used. Similarly, interior hooks must be designed to permit adequate clearance for a concrete tremie pipe (i.e., 12-inch minimum), if concrete is to be tremied into place. Where clearance is a problem, hooks may be placed on dowels that may be rotated after concrete placement or casing removal and repositioned after the tremie is removed. The concrete must remain fluid during dowel repositioning. Shafts that require a large amount of reinforcing steel shall use bundled longitudinal bars to maintain the minimum clear spacing requirement. The assembled rebar cage outside diameter shall be at least 6-inches smaller than the drilled hole diameter, which corresponds to at least 3-inches of concrete cover over the rebar on all sides.

The reinforcing steel in the shaft shall be tied and supported so that the reinforcing steel will remain within allowable tolerances until the concrete will support the reinforcing steel. When concrete is placed by tremie methods, temporary hold-down devices shall be used to prevent uplifting of the steel cage during concrete placement. Concrete spacers or other approved noncorrosive spacing devices shall be used at sufficient intervals not exceeding 5-feet along the shaft excavation. At least three spacers shall be evenly distributed

around the circumference of the reinforcing steel at each elevation where used.

i. Concrete Placement, Curing, and Protection

All concrete placement, consolidation and curing activities shall conform to the recommendations of Section 602 and 812 of the Standard Specifications, except as otherwise specified herein.

Concrete shall be placed as soon as possible after reinforcing steel cage placement. Concrete placement shall be continuous in the shaft to the top elevation of the shaft. Placement shall continue after the shaft is full until good quality concrete is evident at the top of the shaft.

Concrete to be placed in dry shafts less than 50-feet in length may be placed by allowing the concrete to free fall into the excavation, provided that the concrete does not hit the reinforcing steel or the sides of the excavation. This is subject to performance satisfactory to the Engineer during construction. Limit the segregation of the concrete by placing the concrete through the use of a centering tube, sectionalized pipe or other means to direct the free fall of the concrete so that it does not strike the sides or reinforcement of the shaft. If water has infiltrated the base of the excavation, it shall be removed prior to placement of the concrete. No more than 1-inch of standing water shall be allowed in the base of an excavation at the time of concrete placement to prevent segregation of the concrete. The Engineer shall have the final decision as to the allowable amount of water in the base of the excavation. The Engineer may require the Contractor to have a small sump pit in the base of the excavation to allow removal of any accumulated water.

Concrete to be placed in water shall be placed through a tremie or concrete pump. The tremie shall be supported so as to permit free movement or permit rapid lowering when necessary to retard or stop the flow of concrete. The discharge end shall be sealed closed at the start of work so as to prevent water or slurry from entering the tube before the tube is filled with concrete. After placement has started the tremie tube shall be kept full of concrete to the bottom of the hopper. If water enters the tube after placement is started, the tremie shall be withdrawn, the discharge end resealed, and the placement restarted. The flow of concrete shall be continuous until the work is completed. The discharge end of the tremie shall always be located a minimum of 5-feet below the level of the already placed concrete.

Tremie pipes shall be a minimum of 10-inch diameter. Tremie pipes shall not have aluminum parts that will react with concrete. Pump hoses shall be a minimum of 4-inch diameter. All tremie pipe or pump hoses and connections shall be watertight.

The concrete placing rate shall be not less than 30 cubic yards of concrete per each one-hour period. The concrete mix shall be of such design that the concrete remains in workable plastic state throughout the placement of the concrete for the entire drilled shaft.

All concrete, except for that placed under water, shall be vibrated to a depth of 5-feet below the ground surface except where soft uncased soil remaining in the excavation will possibly mix with the concrete. After placement, any exposed surfaces of the shaft concrete shall be protected to allow proper curing.

For at least 48-hours after shaft concrete has been placed, no construction operations that will cause soil movement adjacent to the shaft, other than mild vibration, shall be conducted.

j. Casings and Forms

When the shaft extends above ground or through a body of water, the portion of the shaft exposed above ground or through a body of water may be formed with removable concrete forms except when a permanent form is specified. Removable forms shall be stripped from the shaft in a manner that will not damage the concrete. Forms can be removed when the concrete has attained sufficient strength provided: curing of the concrete is continued for the full 72-hour period in accordance with the specifications and the concrete has reached 75-percent of its design compressive strength as determined from concrete cylinder breaks.

Temporary casings shall be removed while the concrete remains workable. The removal of temporary casing shall not be allowed until the level of the concrete placed in the shaft is great enough to withstand the pressure

exerted by the surrounding soil, water or drilling fluid. After concreting begins, removal of the casing should begin within 1-hour, before the concrete begins to set. Telescoping casing may be used, but the bottom end of the temporary casing shall be located a minimum of 5-ft below the level of already placed concrete. If the concrete begins to set prior to removal of the casing, the removal of the casing should cease, and the casing should be cut off at its current elevation and remain in the ground permanently. No payment shall be given for any casing not retrieved.

Movement of the casing by rotating, exerting downward pressure and tapping to facilitate extraction or extraction with a vibratory hammer will not be permitted. Casing extraction shall be at a slow, uniform rate with the pull in line with the shaft axis. Do not damage or displace reinforcing cage when withdrawing casing.

k. Construction Tolerances

The following construction tolerances shall be maintained in constructing drilled shafts.

1. The center of the drilled shaft shall be within 3-inches of the plan position in the horizontal plane at the plan elevation for the top of the shaft.
2. The vertical alignment of the shaft excavation shall not vary from the plan alignment by more than 0.25-inch per foot.
3. After all the shaft concrete is placed; the top of the reinforcing steel cage shall be no more than 6-inches above and no more than 3-inches below plan position.
4. When casing is used, the inside diameter of the casing shall not be less than the shaft diameter shown on the plans. When casing is not used, the minimum diameter of the drilled shaft shall not be more than 1-inch less than the diameter shown on the plans.
5. The top elevation of the shaft shall be within 1-inch of the plan top of shaft elevation.
6. The bottom of the shaft excavation shall be normal to the axis of the shaft within 1-inch per foot of shaft diameter.
7. The reinforcing steel shall be placed so that the outer edges of the reinforcing cage are located uniformly a minimum of 3-inches inside the perimeter of the design shaft size.

Drilled shaft excavations constructed in such a manner that the concrete shaft cannot be completed within the required tolerances are unacceptable. Correction methods shall be submitted by the Contractor for the Engineer's approval. Approval will be obtained before continuing with the drilled shaft construction. Materials, engineering and work necessary to effect correction for out-of-tolerance drilled shaft excavations shall be furnished at no cost to the Department.

l. Conduit Sweeps

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

m. Record Information

The Contractor shall provide the following minimum record information. For each drilled shaft foundation installed, record on drilled shaft installation logs the location, alignment, dimensions, elevation of the top and bottom, depth of the bearing stratum penetration, description of the materials encountered at all elevations, elevation of the water table during excavation, condition of the bottom of the excavation, concrete data,

verticality and deviation of shaft or reinforcing steel from the plan location, and other data called for on the report form or pertinent to the drilled shaft. Record the theoretical volume of excavation, volume of concrete placed versus depth, and total volume of concrete placed. Report observed irregularities to the Engineer within eight hours of discovery. Record the time drilling started and stopped and any significant stoppages or delays. Record the time concreting started and stopped.

Minimum Record Information shall be in accordance with FHWA Publication No. IF-99-025 "Drilled Shafts" or Association of Drilled Shaft Contractors' "Drilled Shaft Inspector's Manual" (1989). A copy of the inspection report planned for use shall be submitted to the Engineer for approval. Submit draft record information for each completed shaft to the Engineer within twenty-four hours of completion. Submit final record drawings of each drilled shaft installed no more than three weeks after completion of the work. Submit records on a weekly basis, or more frequently if variation occurs.

n. Site Operations

The Contractor shall conduct his operations in a neat and orderly manner. Equipment and materials shall not be placed or stored beyond limits approved by the Engineer and shall promptly be removed when no longer needed. All materials, water, slurry, and auger cuttings shall be confined to the specified work area so as not to migrate from the specified work area.

o. Construction Adjacent to Freshly Drilled Shafts

No construction activity, including drilling, within a radius of three shaft diameters of a freshly drilled shaft shall take place until the concrete shaft has cured for at least 48- hours and the Engineer has provided written approval.

**Method of Measurement:**

The quantity of "Masonry for Light Pole Foundation" will be measured per cubic yard installed and accepted.

**Basis of Payment:**

The payment for the item "Masonry for Light Pole Foundation" as called for by the contract shall be made at the contract unit price(s) per cubic yard complete in place and accepted, which price and payment will constitute full compensation for furnishing and fabricating and placing all materials, clearing and grubbing the areas, normal excavation in accordance with Section 207, concrete and reinforcing bars, construction of foundations, backfilling and compaction, grading, sodding if required to restore the site to its original condition or as required by the Plan, and for all labor, equipment, tools and incidentals necessary to complete the work.

4/29/11

**605500 – CANTILEVER-SIGN SUPPORT AND FOUNDATION****Description:**

This work consists of furnishing all materials, fabricating and installing cantilever sign supports including foundations as called for the Contract, in accordance with the locations, details shown on the Plans and as directed by the Engineer.

The various materials and construction operations not specifically indicated on the Plans and in the specifications shall be in accordance with the latest revised AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals.

**General** - The main support and truss members of the sign support structure shall be fabricated from tubular steel whose diameters, wall thicknesses and lengths shall conform to the requirements and details shown on the Contract Plans, or as shown on approved alternate design drawings.

Alternate designs utilizing structural shapes for the main support and truss members, and which form a structure of sufficient strength and pleasing appearance will also be considered for approval when submitted in accordance with the provisions of these specifications. All submissions for approval including materials and specifications for alternate designs must be signed by a registered Professional Engineer, registered in the State of Delaware.

The bidder is cautioned that maximum consideration will be given to aesthetic considerations for all of the sign supports including, but not necessarily limited to, the general appearance, methods of fabrication and assembly, material selection, arrangement, and end finishes of the proposed structural shapes and the welding and surface finishes as required.

If the bidder elects to furnish sign supports alternate to those shown in the Contract Plans, it is a requirement that as an end result, the alternate will satisfy the requirements of the proposal.

Sign panels, electrification and luminaries are not included under this item.

The contractor shall stake each sign structure location for approval by the engineer. Upon approval, submit working drawings. Show the highest elevation of the traveled roadway and shoulder at each structure location. Upon approval of the working drawings, materials may be ordered.

**Materials:****Structural**

Main Pole, End Braces and Arm Chords:

Minimum Yield Stress = 52,000 psi (55,000 psi for tapered sections]

Structural Shapes, plates, and bars:

Under ¼" - ASTM-A575 Grade 1020

¼" to 1" - AASHTO M 270 Grade 36.

Over 1" - AASHTO M 270 Grade 50.

Web Members: ASTM-A501

Steel Castings: AASHTO M 103 Grade 65 - 35

Pole Tops: ASTM-B26, Aluminum Alloy S5A or  
ASTM-A126, Class-A Cast Iron

**Fasteners**

Clamps: ASTM-A606 Type 4

Anchor Bolts: AASHTO M314 Grade 55

Anchor Nuts: AASHTO M 291 Grade DH (Grade 2H)

Connection Bolts: AASHTO M 164

Nuts: AASHTO M291 Grade DH

Other Bolts and Nuts: ASTM-A307 Grade A

U-Bolts: ASTM-A307

**Finish**

Structural: Galvanized finish AASHTO M 111  
 Fasteners: Galvanized finish AASHTO M 232  
 Concrete: Portland Cement Concrete shall be 4500 psi minimum and shall conform to the material requirements of Class A, Section 812, Portland Cement Concrete of the Standard Specifications.

Bar Reinforcements: Bar reinforcements shall be epoxy coated and meet the requirements of AASHTO M31, Grade 60 and conform to Subsection 603.02 of the Standard Specifications.

**Construction Methods:**

Shop Drawings: Shop drawings shall be submitted in accordance with Subsection 105.04 of the Standard Specifications. Minor variations in details may be permitted; however, any major departure from the design will not be accepted.

The Contractor may at his/her option elect to prepare alternate design plans and specifications for the overhead sign support structures in place of the Plan construction. Detail plans, design computations, and specifications for the proposed structures shall be submitted to the Engineer for approval; and no work shall begin until the alternate design plans have been reviewed and approved, in principle, by the Engineer.

The requirements for the preparation of shop drawings for an approved alternate design (or designs), shall be similar to those specified for the Plan construction.

Fabrication. Loading, transporting, unloading and erection of structural materials shall be done so that the metal will be kept clean and free from injury in handling.

Structural materials shall be stored above the ground upon platforms, skids, or other supports and shall be kept free from accumulation of dirt, oil, acids or other foreign matter.

Structural material which has been deformed shall be straightened before begin laid out, punched, drilled or otherwise worked upon in the shop. Sharp kinks or bends will be cause for rejection.

When sign support structures are subcontracted, the subcontract shall be in accordance with Subsection 108.01 of the Standard Specifications except that the value of the subcontract will be based on the value of the work for fabrication.

Cutting, Punching, Drilling and Finishing. Material 1/2" (12 mm) thick or less may be sheared, sawed or cut with a router. Material more than 1/2" (12 mm) thick shall be sawed or routed.

Cut edges shall be true and smooth and free from excessive burrs or ragged breaks.

Edges of plates carrying calculated stresses shall be planed to a depth of 1/4" (6 mm) except in the case of sawed or routed edges of a quality equivalent to a planed edge.

Re-entrant cuts shall be avoided wherever possible. If used, they shall be filleted by drilling prior to cutting.

Structural material shall not be heated except to facilitate bending; then the structural material may be heated to a temperature not exceeding 400°F (204°C) for a period not exceeding 30 minutes. Such heating shall be done only when temperature and time requirements are observed.

Bolt holes in main members shall be subpunched or sub drilled and reamed to finished size after the parts are firmly bolted together. The amount by which the diameter of sub punched holes is less than that of the finished hole shall be at least 1/4 the thickness of the piece and in no case less than 1/32" (0.8 mm). If the metal thickness is greater than the diameter of the hole, punching shall not be used.

Bolt holes in secondary material not carrying calculated stress may be punched or drilled to finished size before assembly.

All holes shall be cylindrical and perpendicular to the principal surface. Holes shall not be drifted in such a manner as

to distort the metal. All chips lodged between contacting surfaces shall be removed before assembly.

End Post. End post shall be of galvanized steel. After fabrication the steel end post shall be hot-dip galvanized in accordance with AASHTO M111. The average thickness of coating (each side) shall be at least 5 mils (125  $\mu\text{m}$ ), but in no case less than 4 mils (100  $\mu\text{m}$ ) thickness at any location. Inspection of coating will be by magnetic thickness gauge measurements as specified in AASHTO M111 paragraph 9.3, except that the posts will be measured at the fifth points of the length at three locations around the circumference. The average thickness will be arrived at by the fifth points of the length at three locations around the circumference. The average thickness will be arrived at by the summation of all readings.

Truss Span. Truss span shall be galvanized steel. Galvanizing shall be as specified above for the end post. Galvanizing of each truss unit shall be by a single dip process. Magnetic thickness gauge measurements shall be made on each chord of each truss unit at approximately the third points of the chord length at three locations around the circumferences. Prior to shipping, the completed and accepted truss units shall be assembled in the shop and the truss span checked for dimensions, straightness, alignment and camber.

Welding. Welding shall be done in the shop before galvanizing. All welding and oxygen cutting work shall be in accordance with the ANSI/AASHTO/AWS D1.5-88 Bridge Welding Code; and shall be inspected at the Contractor's expense. The inspection results shall be submitted to the Engineer for review and approval.

Repair Galvanizing. Galvanized Surface which have been welded, abraded or damaged at any time after application of the coating shall be repaired by thoroughly wire brushing the damaged areas, removing all paint, loose and cracked coating, and treating the cleaned area with a galvanizing compound finish. However, the repair of galvanized items having one or more damaged areas larger than 1 square inch (650 square millimeters) will not be allowed.

All threading and dimensional requirements shall be in accordance with the "Fastener Standards"; published by the Industrial Fasteners Institute. All threads shall be UNC-2 and, where hot-dip galvanized, internal threads shall be oversized as specified in AASHTO M 291 to provide for proper assembly.

Erection. Material shall not be dropped, thrown or dragged over the ground. The Contractor shall supply detailed, written instructions and drawings for the erection of all sign structure components.

All signs and miscellaneous attachments shall be installed within the same 8-hour period that the trusses are erected.

Excavation and backfill shall conform to the applicable requirements of Section 207 including disposal of unsuitable and surplus material, placing and compacting of Borrow Type C of the Standard Specifications and as indicated on the Plans. Concrete, equipment, handling, measuring and batching, mixing, reinforcing steel, and construction requirements shall conform to Section 602 of the Standard Specifications. There shall be no separate payment for work done in accordance with the requirements of Section 207, and cost shall be included in this item. Payment for Borrow Type C shall be made under separate item of this Contract.

The Contractor shall obtain Engineer's approval of the field locations for the foundations before excavation is begun. Excavations for foundations shall be in accordance with the sub-section "Drilled Shaft Foundations".

End post shall not be erected upon the completed footing until authorized, but the minimum time allowed for the hardening of the concrete before any load is placed thereon shall be 7 calendar days.

Anchor bolts shall be set to template for alignment and elevation and shall be secured in position to prevent displacement while concrete is being placed. The steel reinforcement and conduit elbows shall have been placed and secured before the placing of concrete.

The top surface of the concrete pedestal or barrier shall be leveled off 3" (75 mm) below the elevation of the base of the vertical members of the structure, to provide room for the lower leveling nuts.

Post shall be erected in position to engage the anchor bolts on top of the concrete pedestal or barrier. The entire structure, including truss arm and sign panels, shall be erected and adjusted for plumbness, grades and alignment by manipulation of the leveling nuts on the anchor bolts.

After the cantilever sign structure has been erected and fully loaded including sign panels, the foundation anchorage nuts shall be retightened in accordance with the applicable requirements of Section 605 of the Standard Specifications.

Before final acceptance, all metal surfaces shall be cleaned free of oil, grease, soil or other discoloration. Cleaning shall be done with suitable solvents or by other approved means, and shall be to the satisfaction of the Engineer. If cleaning is necessary after erection over roadways in use, approved suitable means shall be provided for the protection of traffic during cleaning operation.

## **DRILLED SHAFT FOUNDATIONS:**

### **I. DESCRIPTION**

This work shall consist of all labor, materials, equipment, and services necessary to perform all operations to complete the installation of drilled shafts. The work shall be completed in accordance with the plans, Delaware Department of Transportation's *Specifications for Road and Bridge Construction* dated August 2001 (Standard Specifications), and this Special Provision. The work involves installing constant-diameter drilled shafts through Coastal Plain sediments and Piedmont Residuum. High water tables may be present.

### **II. Materials**

Materials shall meet the following requirements:

#### **A. Portland Cement Concrete**

Portland cement concrete shall be 4500 psi minimum (Class A) and shall meet the requirements specified in Section 602 and 812, in the Delaware Department of Transportation's *Specifications for Road and Bridge Construction* (August 2001). Where not otherwise specified, ACI 336.1-94 shall be followed. Water used in mixing concrete shall conform to Section 803 of the Standard Specifications.

Concrete shall remain workable and maintain a 4-inch slump for up to four hours after placing. If free fall methods are utilized for placement, the maximum coarse aggregate size shall be reduced to 3/8-inch. A slump value range of  $5 \pm 1$  inch shall be provided for all uncased holes and a slump range of  $6 \pm 1.5$  inch shall be provided for cased holes. A minimum slump of 6-inch with the addition of a retarder is required when a casing is being withdrawn. An acceptable water reducing and retarding admixture shall be added to the concrete to produce the specified slump. Under no circumstances shall the admixture cause segregation of the concrete. If any admixtures are added to the concrete at the site, the admixture must be added to the concrete by a qualified Contractor-furnished technician. Immediately after the addition of the admixture, the drum shall be turned a minimum of thirty revolutions, at mixing speed, until the concrete is thoroughly mixed. The technician shall then test the slump and consistency of the concrete mixture. Under no circumstances shall the Contractor add additional water to the concrete mixture to reach the desired slump.

#### **B. Reinforcing Steel**

Deformed reinforcing bars shall be in accordance with the sizes, spacing, dimensions, and details shown on the plans and shall conform to AASHTO M31, Grade 60, and the requirements of Section 603 and 604 of the Specifications.

#### **C. Casing**

Casing shall be metal, smooth, clean, watertight, and of ample strength to withstand both handling and driving stresses and the pressure of both concrete and the surrounding earth materials. Thickness of the casings shall not be less than 0.25-inch. The inside diameter of casing shall not be less than the specified size of the shaft. No extra compensation will be allowed for concrete required to fill an oversized casing or oversized excavation. All casings shall be removed from shaft excavations. Permanent steel casings shall not be used.

#### **D. Slurry**

Use of slurry shall not be permitted.

### **III. CONTRACTOR QUALIFICATIONS**

This work shall be performed under the supervision of the contractor's superintendent, who will be fully knowledgeable and experienced, as defined herein, in the construction of drilled shaft foundations of similar sized shafts and geotechnical conditions using both cased and slurry methods. Further, the Contractor and the Contractor's superintendent performing the work shall have at least five years previous experience within the last eight years constructing drilled shafts, with at least two years at the current firm. The Contractor's equipment shall have the capacity to undertake the work and shall be sufficient to complete the work within the specified contract time.

The Contractor shall provide documentation of his qualifications, experience record, prior project references, and the availability of the equipment needed to perform the required work. All prior project references shall be currently available personnel who can verify the quality of the contractor's previous work and shall include current name, address, and telephone number. This documentation shall reference the experience of the drilled shaft contractor and the drilled shaft contractor's superintendent in responsible charge of the drilled shaft operations. This documentation shall reference successful construction of similar sized shafts in the following conditions:

Experience in successfully installing drilled shafts of the size shown in the plans. The minimum experience shall consist of ten similar-sized projects in the past five years. Descriptions of projects must include a point of contact with the owner that is familiar with the project.

Experience in cleaning shaft bottoms when working under wet conditions.

#### **IV. EQUIPMENT**

The Contractor shall furnish all equipment and instrumentation necessary for installation of the shafts. The excavation and drilling equipment shall have adequate capacity including power, torque, and down thrust to excavate a hole of the maximum diameter shown on the plans and to a depth of 15-feet or 20 percent beyond the depths shown in the contract documents, whichever is greater.

The excavation and tools shall be of adequate design, size, and strength to perform the work shown in the contract documents or described herein. When the material encountered cannot be drilled using conventional earth augers with soil or rock teeth, drilling buckets, and/or overreaming tools, the Contractor shall provide special drilling equipment including but not limited to: rock core barrels, rock tools, air tools, blasting materials, and other equipment as necessary to construct the shaft excavation to the size and depth required. Approval of the Engineer is required before excavation by blasting is permitted.

Provide a descriptive listing of available equipment that is fully capable of cleaning shaft bottoms when shafts are excavated under wet conditions.

#### **V. SITE INFORMATION**

Test Boring Log sheets are included in the contract documents for use by the Contractor. Data on subsurface conditions is not intended as representations or warranties of continuity of such conditions. It is expressly understood that the Department will not be responsible for interpretations or conclusions drawn there from by the Contractor. The data is made available for the convenience of the Contractor. The Contractor may make additional test borings and other exploratory operations at no additional cost to the Department.

Three separate geotechnical data reports titled *Delaware Turnpike Improvements, Report No.1 Mainline Improvements*, dated September 26, 2005, *Delaware Turnpike Improvements, Report No. 2 SR1 Interchange*, dated September 26, 2005 and *Delaware Turnpike Improvements Report No.4 Northbound Widening* dated June 21, 2005 have also been prepared by RK&K for this project. These reports were prepared to establish design guidelines only and should not be considered part of the contract documents nor as a warranty of subsurface conditions. These reports may not be sufficient for use by specialty contractors. Contractors or prospective bidders may contact the Delaware Department of Transportation to review a copy of these reports.

#### **VI. SUBMITTALS**

The Contractor shall submit to the Engineer for review and approval, an installation plan for the construction of drilled shafts not less than thirty days before the start of work as detailed in this Special Provision. The submittal shall include the following:

- A. List of proposed equipment to be used including cranes, drills, augers, bailing buckets, final cleaning equipment, tremie or concrete pumps, casing, and other appurtenances.
- B. Details of overall construction operation sequence and the sequence of shaft construction in bents or groups, including scaled plan and profile showing the location, size and movements of equipment setup and operations. The completion of any required integrity and loading tests shall be noted in this construction operation sequence.
- C. Submit project experience and resumes in accordance with Section III.- Contractor Qualification.
- D. Details of shaft excavation and stabilization methods.
- E. Method of monitoring verticality of the shaft excavation during excavation and details of proposed corrective measures to be implemented as necessary.
- F. Very specific details of methods to clean the shaft excavation. Details shall include at least three alternative bottom cleaning methods with descriptions of equipment to be used when installing drilled shafts with wet methods. Include details of method for identifying type of bearing material for consistency with design assumptions prior to placement of concrete.
- G. Details of reinforcement placement including support and centralization methods.
- H. The concrete mix design, including admixtures to be used. Details of concrete placement, curing, and protection.
- I. A copy of the proposed report format for planned shaft inspections. Record information for each shaft and details of any required load or integrity tests.
- J. Other information shown on the plans or requested by the Engineer.

The Contractor will not be permitted to start construction of any drilled shaft, until the complete installation plan submittal as described above has been received, reviewed and written approval to begin construction has been issued by the Engineer. The Contractor will not be permitted to start the construction of drilled shafts for which working drawings are required until the Engineer has approved such drawings. Such approval will not relieve the Contractor of responsibility for results obtained by the use of these drawings or any of his other responsibilities under the contract. Submittals during construction shall include record information for each shaft and details of any required loading or integrity tests as required.

## **VII. CONSTRUCTION METHODS**

### **A. Protection of Existing Structures**

All reasonable precautions shall be taken to prevent damage to all existing structures, utilities, and the public. These measures shall include but are not limited to, selecting construction methods and procedures that will prevent excessive caving of the shaft excavation, monitoring, and controlling the vibrations from the driving of casing or sheeting, drilling of the shaft, or from blasting, if permitted. The Contractor shall verify that there are no subsurface utilities in close proximity of each shaft before beginning excavation activities.

### **B. Construction Sequence**

Where drilled shafts are to be installed in conjunction with embankment placement, they shall be constructed after the placement of the fill. Excavation of adjacent drilled shafts or other structures or utilities within a radius of three shaft diameters will not be permitted until concrete has been in place for at least 48 hours.

### **C. Methods of Construction**

Excavations required for shafts shall be performed through whatever materials are encountered, to the dimensions and elevations shown on the plans or otherwise required by the Standard Specifications and Special Provisions. The method

used shall be suitable for the intended purpose and materials encountered. The dry method or temporary casing method will be used as necessary to produce sound, durable concrete foundation shafts that are free of any defects. Wet method may only be used after the Engineers approval. The Engineer shall only permit blasting if specifically stated in the contract documents or authorized in writing. When a particular method of construction is required in the contract documents, that method shall be used. If no particular method is specified for use, the Contractor shall select and use the method, as determined by site conditions, subject to approval of the Engineer, which is needed to properly accomplish the work. All shafts shall extend and bear approximately one-half diameter into rock except those shafts noted on the plans that terminate and bear in decomposed rock. In the event competent bedrock is not encountered during the drilled shaft excavation, the shaft shall be extended to bear at lower level elevations as determined by the Engineer. The estimated lengths shown on the plans and in the geotechnical reports should be considered approximate. Additional shaft lengths might be required depending on actual subsurface conditions. Shorter shaft lengths than indicated on the plans or in the geotechnical reports may only be constructed with the written approval of the Engineer.

#### **1. Dry Construction Method**

The dry construction method shall be used only at sites where the ground-water table and site conditions are suitable to permit construction of the shaft in a relatively dry excavation (i.e., less than 3-inch of water accumulates above the final base elevation over a one-hour period when no pumping is permitted), and where the sides and bottom of the shaft are stable and may be visually inspected prior to placing the concrete.

The dry method consists of drilling the shaft excavation, removing accumulated water and loose material from the excavation, placing temporary casing, inspecting the bearing stratum, removing temporary casing, placing the reinforcing steel if required, and placing the shaft concrete in a relatively dry excavation. If caving occurs or if there is excess seepage into the drilled shaft, the drilling should be continued using a casing to maintain the integrity of the hole. Concrete shall be placed in accordance with Section VII.I.

#### **2. Wet Construction Method**

The wet construction method shall not be used.

#### **3. Temporary Casing Construction Method**

The temporary casing construction method shall be used at all sites where excessive caving or seepage could occur. When a nearly impervious formation is reached, a temporary casing shall be placed in the hole and sealed in the nearly impervious formation. As an alternative to use of the wet excavation method, temporary casing may be installed by drilling, driving, or vibratory procedures in advance of excavation to the lower limits of the caving material. Slurry may not be considered. Significant caving shall be considered to be more than 50% increased volume over theoretical shaft volume, for a section exceeding 10-feet of shaft. Casing shall be installed to the final base elevation to allow inspection of the bearing stratum.

After the reinforcing steel cage has been placed, fill the excavation with concrete. Before the casing is withdrawn and while the casing is being withdrawn, the level of fresh concrete in the casing shall be at such a level that all the fluid trapped behind the casing is displaced upward without contaminating the shaft concrete. Placement of the concrete and pulling of the temporary casing shall be conducted in accordance with Sections VII.I and VII.J.

#### **4. Alternative Construction Methods**

The Contractor may propose alternative methods to prevent caving and control ground water. Such proposals, accompanied by supporting technical data, shall be submitted in accordance with Section VI, Submittals. Written approval from the Engineer is required before the use of alternative construction methods.

### **D. Excavations**

The bottom elevation of drilled shafts shown on the plans may be adjusted during construction if the Engineer determines that the foundation material encountered during excavation is unsuitable or differs from that anticipated in the design of the drilled shaft. The Contractor shall take soil samples when shown on the plans or as directed by the Engineer to determine the character of the material directly below the shaft excavation. The Engineer will inspect the samples or

cores and determine the final depth of required shaft excavation.

The Contractor shall maintain a construction method log during shaft excavation. The log shall contain information such as the description and approximate top and bottom elevation of each soil or rock material, seepage or groundwater, and remarks.

Excavated materials, which are removed from the shaft excavation and any drilling fluids used, shall be disposed of off site in accordance with local environmental regulations and the contract documents or as directed by the Engineer.

#### **1. Unclassified Excavation**

Drilled shaft excavation is designated as unclassified; the Contractor shall provide the necessary equipment to remove and dispose of any materials encountered in forming the drilled shaft excavation to the dimensions shown on the plans or as directed by the Engineer. No separate payment will be made for excavation of materials of different densities and character.

The Contractor shall provide tools such as augers fitted with either soil or rock teeth, and drilling buckets attached to drilling equipment of the size, power, torque, and down thrust approved for use by the Engineer. Material normally classified as decomposed rock, weathered, rock, disintegrated rock, or rock shall be considered as unclassified excavation. The Contractor shall provide appropriate tools such as, but not limited to, equipment listed in Section IV of these provisions in order to install the drilled shafts to their design depths.

#### **E. Obstructions**

The Contractor shall remove surface and subsurface obstructions at drilled shaft locations. Such obstructions may include man-made materials, such as old concrete foundations, and natural materials, such as boulders. Boulders are defined as stones with a least dimension greater than 1-foot. Special tools and/or procedures shall be employed by the Contractor after the hole cannot be advanced more than 1-foot in thirty minutes using approved equipment operating at maximum power, torque, and down thrust, using conventional augers fitted with soil or rock teeth, drilling buckets, and/or under-reaming tools. Such special procedures/tools may include but are not limited to: chisels, boulder breakers, core barrels, air tools, hand excavation, temporary casing, and increasing hole diameter. Blasting shall not be permitted unless specifically approved in writing by the Engineer.

#### **F. Lost Tools**

Drilling tools that are lost in the excavation shall not be considered obstructions and shall be promptly removed by the Contractor without compensation. All costs due to lost tool removal shall be borne by the Contractor including but not limited to costs associated with hole degradation due to removal operations or the time the hole remains open.

#### **G. Excavation Inspection**

The Contractor shall provide details of shaft construction to the Engineer for review. The Contractor shall provide equipment for checking the dimensions and alignment of each shaft excavation. The Contractor shall determine the shaft dimensions and alignment under the observation and/or direction of the Engineer. Final shaft depth shall be measured after final cleaning. Shaft cleanliness and the bearing surface condition will be evaluated and approved by the Engineer. The Contractor shall provide safe access and egress to the Engineer for inspection of the bottom of the excavation prior to placement of reinforcing steel and concrete. After the Contractor has prepared the bottom of the shaft excavation, the Contractor shall notify the Engineer. The Contractor shall coordinate schedules for excavation inspection by the Engineer.

The Contractor shall not permit any worker to enter the shaft excavation for any reason unless: both a suitable casing has been installed and the water level has been lowered and stabilized below the level to be occupied, and adequate safety equipment and procedures have been provided to workers entering the excavation. The Contractor shall follow OSHA guidelines for confined space entry. Prior to placement of reinforcing steel and concrete, the Contractor shall ensure that loose material from the bottom and sides of excavation have been removed and that shaft is within the specified tolerances. Specified tolerances are listed in Section VII.K of this Special Provision. The shaft excavation shall be cleaned to remove all accumulated sediment and water. The Contractor shall be responsible for correcting drilled shafts that are not constructed within the specified tolerances. Remedial measures, including engineering analysis and

redesign, to correct for out-of-tolerance drilled shaft foundations, shall be performed at no additional cost to the Department.

#### **H. Reinforcing Steel Cage Construction and Placement**

The reinforcing steel cage consisting of the steel shown on the plans plus cage stiffener bars, spacers, centralizers, and other necessary appurtenances shall be completely assembled and placed as a unit immediately after the shaft excavation is inspected and accepted and prior to shaft concrete placement. Prior to installation of the steel cage in the shaft excavation, inspect and clean the reinforcing steel of materials that prevent effective bonding. Clear spacing between bars of the rebar cage shall be at least five times the size of the maximum coarse aggregate. Hooks at the top of the rebar cage shall not be bent outward if temporary casing will be used. Similarly, interior hooks must be designed to permit adequate clearance for a concrete tremie pipe (i.e., 12-inch minimum), if concrete is to be tremied into place. Where clearance is a problem, hooks may be placed on dowels that may be rotated after concrete placement or casing removal and repositioned after the tremie is removed. The concrete must remain fluid during dowel repositioning. Shafts that require a large amount of reinforcing steel shall use bundled longitudinal bars to maintain the minimum clear spacing requirement. The assembled rebar cage outside diameter shall be at least 6-inches smaller than the drilled hole diameter, which corresponds to at least 3-inches of concrete cover over the rebar on all sides.

The reinforcing steel in the shaft shall be tied and supported so that the reinforcing steel will remain within allowable tolerances until the concrete will support the reinforcing steel. When concrete is placed by tremie methods, temporary hold-down devices shall be used to prevent uplifting of the steel cage during concrete placement. Concrete spacers or other approved noncorrosive spacing devices shall be used at sufficient intervals not exceeding 5-feet along the shaft excavation. At least three spacers shall be evenly distributed around the circumference of the reinforcing steel at each elevation where used.

#### **I. Concrete Placement, Curing, and Protection**

All concrete placement, consolidation and curing activities shall conform to the recommendations of Section 602 and 812, of the Standard Specifications, except as otherwise specified herein.

Concrete shall be placed as soon as possible after reinforcing steel cage placement. Concrete placement shall be continuous in the shaft to the top elevation of the shaft. Placement shall continue after the shaft is full until good quality concrete is evident at the top of the shaft.

Concrete to be placed in dry shafts less than 100-feet in length may be placed by allowing the concrete to free fall into the excavation. This is subject to performance satisfactory to the Engineer during construction. Limit the segregation of the concrete by placing the concrete through the use of a centering tube, sectionalized pipe or other means to direct the free fall of the concrete so that it does not strike the sides or reinforcement of the shaft. If water has infiltrated the base of the excavation, it shall be removed prior to placement of the concrete. No more than 1-inch of standing water shall be allowed in the base of an excavation at the time of concrete placement to prevent segregation of the concrete. The Engineer shall have the final decision as to the allowable amount of water in the base of the excavation. The Engineer may require the Contractor to have a small sump pit in the base of the excavation to allow removal of any accumulated water.

Concrete to be placed in water shall be placed through a tremie or concrete pump. The tremie shall be supported so as to permit free movement or permit rapid lowering when necessary to retard or stop the flow of concrete. The discharge end shall be sealed closed at the start of work so as to prevent water or slurry from entering the tube before the tube is filled with concrete. After placement has started the tremie tube shall be kept full of concrete to the bottom of the hopper. If water enters the tube after placement is started, the tremie shall be withdrawn, the discharge end resealed, and the placement restarted. The flow of concrete shall be continuous until the work is completed. The discharge end of the tremie shall always be located a minimum of 5-feet below the level of the already placed concrete. As concrete is placed in the excavation, the slurry shall be collected and properly disposed of as approved by the Engineer.

Tremie pipes shall be a minimum of 10-inch diameter. Tremie pipes shall not have aluminum parts that will react with concrete. Pump hoses shall be a minimum of 4-inch diameter. All tremie pipe or pump hoses and connections shall be watertight.

The concrete placing rate shall be not less than 30 cubic yards of concrete per each one-hour period. The concrete mix

shall be of such design that the concrete remains in workable plastic state throughout the placement of the concrete for the entire drilled shaft.

All concrete, except for that placed under water, shall be vibrated to a depth of 5-feet below the ground surface except where soft uncased soil remaining in the excavation will possibly mix with the concrete. After placement, any exposed surfaces of the shaft concrete shall be protected to allow proper curing.

For at least forty-eight hours after shaft concrete has been placed, no construction operations that will cause soil movement adjacent to the shaft, other than mild vibration, shall be conducted.

#### **J. Casings and Forms**

When the shaft extends above ground or through a body of water, the portion of the shaft exposed above ground or through a body of water may be formed with removable concrete forms except when a permanent form is specified. Removable forms shall be stripped from the shaft in a manner that will not damage the concrete. Forms can be removed when the concrete has attained sufficient strength provided: curing of the concrete is continued for the full seventy-two-hour period in accordance with the specifications and the concrete has reached 75-percent of its design compressive strength as determined from concrete cylinder breaks.

Temporary casings shall be removed while the concrete remains workable. The removal of temporary casing shall not be allowed until the level of the concrete placed in the shaft is great enough to withstand the pressure exerted by the surrounding soil, water or drilling fluid. After concreting begins, removal of the casing should begin within one hour, before the concrete begins to set. Telescoping casing may be used but the bottom end of the temporary casing shall be located a minimum of 5-ft below the level of already placed concrete. If the concrete begins to set prior to removal of the casing, the removal of the casing should cease, and the casing should be cut off at its current elevation and remain in the ground permanently. No payment shall be given for any casing not retrieved.

Movement of the casing by rotating, exerting downward pressure and tapping to facilitate extraction or extraction with a vibratory hammer will not be permitted. Casing extraction shall be at a slow, uniform rate with the pull in line with the shaft axis. Do not damage or displace reinforcing cage when withdrawing casing.

#### **K. Construction Tolerances**

The following construction tolerances shall be maintained in constructing drilled shafts.

1. The center of the drilled shaft shall be within 3-inches of the plan position in the horizontal plane at the plan elevation for the top of the shaft.
2. The vertical alignment of the shaft excavation shall not vary from the plan alignment by more than 0.25-inch per foot.
3. After all the shaft concrete is placed; the top of the reinforcing steel cage shall be no more than 6-inches above and no more than 3-inches below plan position.
4. When casing is used, the inside diameter of the casing shall not be less than the shaft diameter shown on the plans. When casing is not used, the minimum diameter of the drilled shaft shall not be more than 1-inch less than the diameter shown on the plans.
5. The top elevation of the shaft shall be within 1-inch of the plan top of shaft elevation.
6. The bottom of the shaft excavation shall be normal to the axis of the shaft within 1-inch per foot of shaft diameter.
7. The reinforcing steel shall be placed so that the outer edges of the reinforcing cage are located uniformly a minimum of 3-inches inside the perimeter of the design shaft size.

Drilled shaft excavations constructed in such a manner that the concrete shaft cannot be completed within the required tolerances are unacceptable. Correction methods shall be submitted by the Contractor for the Engineer's approval.

Approval will be obtained before continuing with the drilled shaft construction. Materials, engineering and work necessary to effect correction for out-of-tolerance drilled shaft excavations shall be furnished at no cost to the Department.

**L. Record Information**

The Contractor shall provide the following minimum record Information. For each drilled shaft foundation installed, record on drilled shaft installation logs the location, alignment, dimensions, elevation of the top and bottom, depth of the bearing stratum penetration, description of the materials encountered at all elevations, elevation of the water table during excavation, condition of the bottom of the excavation, slurry test data, concrete data, verticality and deviation of shaft or reinforcing steel from the plan location, and other data called for on the report form or pertinent to the drilled shaft. Record the theoretical volume of excavation, volume of concrete placed versus depth, and total volume of concrete placed. Report observed irregularities to the Engineer within eight hours of discovery.

Minimum Record Information shall be in accordance with FHWA Publication No. IF-99-025 "Drilled Shafts" or Association of Drilled Shaft Contractors' "Drilled Shaft Inspector's Manual" (1989). A copy of the inspection report planned for use shall be submitted to the Engineer for approval. Submit draft record information for each completed shaft to the Engineer within twenty-four hours of completion. Submit final record drawings of each drilled shaft installed no more than three weeks after completion of the work. Submit records on a weekly basis, or more frequently if variation occurs.

**M. Site Operations**

The Contractor shall conduct his operations in a neat and orderly manner. Equipment and materials shall not be placed or stored beyond limits approved by the Engineer and shall promptly be removed when no longer needed. All materials, water, slurry, and auger cuttings shall be confined to the specified work area so as not to migrate from the specified work area.

**N. Construction Adjacent to Freshly Drilled Shafts**

No construction activity, including drilling, within a radius of three shaft diameters of a freshly drilled shaft shall take place until the concrete shaft has cured for at least twenty-four hours and the Engineer has provided written approval.

**Method of Measurement:**

The quantity of cantilever sign supports and foundations will not be measured, but will be paid for at the contract lump sum price bid for "Cantilever-Sign Supports and Foundations."

**Basis of Payment:**

The payment for the item "Cantilever Sign Supports and Foundations" as called for by the contract shall be made at the contract price(s) bid per Lump Sum complete in place and accepted, which price and payment will constitute full compensation for furnishing all materials, fabricating and erecting the structure(s) at designated location(s), including clearing and reinforcing bars, construction of foundations, backfilling and compaction, grading, sodding if required to restore the site to existing condition, for all labor, equipment, tools, and all incidentals necessary to complete the work. Payment for Borrow Type C shall be made under separate item of this Contract. If obstruction removal/excavation is encountered, including rock excavation, payment shall be made at a fixed price of \$150.00 per cubic yard for a quantity up to and including 15 cubic yards. For quantity exceeding 15 cubic yards, the unit price shall be negotiated with the Contractor.

**NOTE**

Since more than one structure is required, the Contractor shall submit a cost breakdown of his Lump Sum price bid for this item showing the dollar value amount for each cantilever-sign support structure with foundation, the sum of which to equal the lump sum price bid.

The Department reserves the right to delete from the contract, construction of one or more individual sign structure(s), and the lump sum price to be paid will be reduced in accordance with the Contractor's itemized bid price

list for that individual sign structure. There shall be no extra compensation to the Contractor if such deletion is made.

4/6/11

**605523 - BOX TRUSS TYPE OVERHEAD SIGN SUPPORTS AND FOUNDATIONS****Description:**

This work consists of furnishing all material and fabricating and erecting box truss type overhead sign support structure(s) and concrete foundations, in accordance with these specifications, details and notes on the Plans and as directed by the Engineer.

The various materials and construction operations not specifically indicated on the Plans and in the specifications shall be in accordance with the latest revised AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals.

**General:**

The main support and truss members of the sign support structure shall be fabricated from tubular steel whose shapes could be circular, square or rectangular as applicable to the Contract, wall thicknesses and lengths shall conform with the requirements and details shown on the Contract Plans, or as shown on approved alternate design drawings.

Alternate designs utilizing structural shapes for the main support and truss members, which form a structure of sufficient strength as required by AASHTO standard and Plans will also be considered for approval when submitted in accordance with the provisions of these specifications. All submissions for approval including material specifications and alternate designs must be signed by a registered Professional Engineer registered in the State of Delaware.

The Contractor is informed that consideration will be given to aesthetics for all of the sign supports including, but not limited to, the general appearance, methods of fabrication and assembly, material selection, arrangement, end finishes of the proposed structural shapes, the welding, and the surface finishes as required. The span type structure carrying Variable Message Signs shall be 4-chord structure.

If the bidder elects to furnish sign supports alternate to those shown in the Contract Plans, the alternate design shall meet the requirements of the approved drawings and any other requirements specified on the Plans and these specifications.

If the bidder elects to furnish sign supports alternate to those shown in the Contract Plans, it is a requirement that as an end result, the alternate will satisfy the requirements of the proposal.

Sign panels, electrification and luminaries are not included under this item.

The contractor shall stake each sign structure location for approval by the engineer. Upon approval, submit working drawings. Show the highest elevation of the traveled roadway and shoulder at each structure location. Upon approval of the working drawings, materials may be ordered.

**Materials:****Structural**

Main Poles, End Braces and Arm Chords:

Minimum Yield Stress = 52,000 psi (55,000 psi for tapered sections]

Structural Shapes, plates, and bars:

Under ¼" - ASTM-A575 Grade 1020

¼" to 1" - AASHTO M 270 Grade 36.

Over 1" - AASHTO M 270 Grade 50.

Web Members: ASTM-A501

Steel Castings: AASHTO M 103 Grade 65 - 35

Pole Tops: ASTM-B26, Aluminum Alloy S5A or  
ASTM-A126, Class-A Cast Iron

**Fasteners**

Clamps: ASTM-A606 Type 4  
 Anchor Bolts: AASHTO M314 Grade 55  
 Anchor Nuts: AASHTO M 291 Grade DH (Grade 2H)  
 Connection Bolts: AASHTO M 164  
 Nuts: AASHTO M291 Grade DH  
 Other Bolts and Nuts: ASTM-A307 Grade A  
 U-Bolts: ASTM-A307

**Finish**

Structural: Galvanized finish AASHTO M 111  
 Fasteners: Galvanized finish AASHTO M 232

Concrete: Portland Cement Concrete shall be 4500 psi minimum and shall conform to the material requirements of Class A, Section 812, Portland Cement Concrete of the Standard Specifications.

Bar Reinforcements: Bar reinforcements shall be epoxy coated and meet the requirements of AASHTO M31, Grade 60 and conform to Subsection 603.02 of the Standard Specifications.

**Construction Methods:**

Shop Drawings. Shop drawings shall be submitted in accordance with Subsection 105.04 of the Standard Specifications. Minor variations in details may be permitted; however, any major departure from the design will not be accepted.

The Contractor may at his/her option elect to prepare alternate design plans and specifications for the overhead sign support structures in place of the Plan construction. Detail plans, design computations, and specifications for the proposed structures shall be submitted to the Engineer for approval; and no work shall begin until the alternate design plans have been reviewed and approved, in principle, by the Engineer.

The requirements for the preparation of shop drawings for an approved alternate design (or designs), shall be similar to those specified for the Plan construction.

Fabrication. Loading, transporting, unloading and erection of structural materials shall be done so that the metal will be kept clean and free from injury in handling.

Structural materials shall be stored above the ground upon platforms, skids, or other supports and shall be kept free from accumulation of dirt, oil, acids or other foreign matter.

Structural material which has been deformed shall be straightened before begin laid out, punched, drilled or otherwise worked upon in the shop. Sharp kinks or bends will be cause for rejection.

When sign support structures are subcontracted, the subcontract shall be in accordance with Subsection 108.01 of the Standard Specifications except that the value of the subcontract will be based on the value of the work for fabrication.

Cutting, Punching, Drilling and Finishing. Material 1/2<sup>2</sup> (12 mm) thick or less may be sheared, sawed or cut with a router. Material more than 1/2<sup>2</sup> (12 mm) thick shall be sawed or routed.

Cut edges shall be true and smooth and free from excessive burrs or ragged breaks.

Edges of plates carrying calculated stresses shall be planed to a depth of 1/4<sup>2</sup> (6 mm) except in the case of sawed or routed edges of a quality equivalent to a planed edge.

Re-entrant cuts shall be avoided wherever possible. If used, they shall be filleted by drilling prior to cutting.

Structural material shall not be heated except to facilitate bending; then the structural material may be heated to a temperature not exceeding 400BOL176f"Symbol"\s10F (204°C) for a period not exceeding 30 minutes. Such heating shall be done only when temperature and time requirements are observed.

Bolt holes in main members shall be subpunched or subdrilled and reamed to finished size after the parts are firmly bolted together. The amount by which the diameter of subpunched holes is less than that of the finished hole shall be at least 1/4 the thickness of the piece and in no case less than 1/32<sup>2</sup> (0.8 mm). If the metal thickness is greater than the diameter of the hole, punching shall not be used.

Bolt holes in secondary material not carrying calculated stress may be punched or drilled to finished size before assembly.

All holes shall be cylindrical and perpendicular to the principal surface. Holes shall not be drifted in such a manner as to distort the metal. All chips lodged between contacting surfaces shall be removed before assembly.

End Post Assemblies. End post assemblies shall be of galvanized steel. After fabrication the steel end post assemblies shall be hot-dip galvanized in accordance with AASHTO M111. The average thickness of coating (each side) shall be at least 5 mils (125 μm), but in no case less than 4 mils (100 μm) thickness at any location. Inspection of coating will be by magnetic thickness gauge measurements as specified in AASHTO M111 paragraph 9.3, except that 25 percent of the horizontal and diagonal struts will be measured, and the posts will be measured at the fifth points of the length at three locations around the circumference. The average thickness will be arrived at by the fifth points of the length at three locations around the circumference. The average thickness will be arrived at by the summation of all readings.

Truss Spans. Truss spans shall be galvanized steel. Galvanizing shall be as specified above for end post assemblies. Galvanizing of each truss unit shall be by a single dip process. Magnetic thickness gauge measurements shall be made on each chord of each truss unit at approximately the third points of the chord length at three locations around the circumferences. Prior to shipping, the completed and accepted truss units shall be assembled in the shop and the truss span checked for dimensions, straightness, alignment and camber.

Welding. Welding shall be done in the shop before galvanizing. All welding work shall be done in accordance with the requirements of ANSI/AASHTO/AWS D1.5-88, and shall be inspected at Contractor's expense. The inspection results shall be submitted to the Engineer for approval.

Repair Galvanizing. Galvanized areas damaged during shipping or erection shall be repaired by any of the three methods specified under ASTM A780. In all cases, the repair shall achieve the minimum coating thickness specified.

Erection. Material shall not be dropped, thrown or dragged over the ground. The Contractor shall supply detailed, written instructions and drawings for the erection of all sign structure components.

All signs and miscellaneous attachments shall be installed within the same 8-hour period that the trusses are erected.

Excavation and backfill shall conform to the applicable requirements of Section 207 including disposal of unsuitable and surplus material, placing and compacting of Borrow Type C of the Standard Specifications and as indicated on the Plans. Concrete, equipment, handling, measuring and batching, mixing, reinforcing steel, and construction requirements shall conform to Section 602 of the Standard Specifications. Cost for work done in accordance with Section 207 shall be included in this item 605523; however, payment for Borrow Type C shall be made under separate item of this Contract.

The Contractor shall obtain Engineer's approval of the field locations of the foundations before excavation is begun. Excavations for foundations shall be in accordance with the sub-section "Drilled Shaft Foundations".

End posts shall not be erected upon the completed footing until authorized, but the minimum time allowed for the hardening of the concrete before any load is placed thereon shall be 7 calendar days.

Anchor bolts shall be set to template for alignment and elevation and shall be secured in position to prevent displacement while concrete is being placed. The steel reinforcement and conduit elbows shall have been placed and secured before the placing of concrete.

The top surface of the concrete pedestal or barrier shall be leveled off 3/8" (75 mm) below the elevation of the base of the vertical members of the structure, to provide room for the lower leveling nuts.

Posts shall be erected in position to engage the anchor bolts on top of the concrete pedestal or barrier. The entire structure, including truss arms and sign panels, shall be erected and adjusted for plumbness, grades and alignment by manipulation of the leveling nuts on the anchor bolts.

## **DRILLED SHAFT FOUNDATIONS:**

### **I. DESCRIPTION**

This work shall consist of all labor, materials, equipment, and services necessary to perform all operations to complete the installation of drilled shafts. The work shall be completed in accordance with the plans, Delaware Department of Transportation's Specifications for Road and Bridge Construction dated August 2001 (Standard Specifications), and this Special Provision. The work involves installing constant-diameter drilled shafts through Coastal Plain sediments and Piedmont Residuum. High water tables may be present.

### **II. Materials**

Materials shall meet the following requirements:

#### **A. Portland Cement Concrete**

Portland cement concrete shall be 4500 psi minimum (Class A) and shall meet the requirements specified in Section 602 and 812, in the Delaware Department of Transportation's Specifications for Road and Bridge Construction (August 2001). Where not otherwise specified, ACI 336.1-94 shall be followed. Water used in mixing concrete shall conform to Section 803 of the Standard Specifications.

Concrete shall remain workable and maintain a 4-inch slump for up to four hours after placing. If free fall methods are utilized for placement, the maximum coarse aggregate size shall be reduced to 3/8-inch. A slump value range of 5 ±1-inch shall be provided for all uncased holes and a slump range of 6 ±1.5-inch shall be provided for cased holes. A minimum slump of 6-inch with the addition of a retarder is required when a casing is being withdrawn. An acceptable water reducing and retarding admixture shall be added to the concrete to produce the specified slump. Under no circumstances shall the admixture cause segregation of the concrete. If any admixtures are added to the concrete at the site, the admixture must be added to the concrete by a qualified Contractor-furnished technician. Immediately after the addition of the admixture, the drum shall be turned a minimum of thirty revolutions, at mixing speed, until the concrete is thoroughly mixed. The technician shall then test the slump and consistency of the concrete mixture. Under no circumstances shall the Contractor add additional water to the concrete mixture to reach the desired slump.

#### **B. Reinforcing Steel**

Deformed reinforcing bars shall be in accordance with the sizes, spacing, dimensions, and details shown on the plans and shall conform to AASHTO M31, Grade 60, and the requirements of Section 603 and 604 of the Specifications.

#### **C. Casing**

Casing shall be metal, smooth, clean, watertight, and of ample strength to withstand both handling and driving stresses and the pressure of both concrete and the surrounding earth materials. Thickness of the casings shall not be less than 0.25-inch. The inside diameter of casing shall not be less than the specified size of the shaft. No extra compensation will be allowed for concrete required to fill an oversized casing or oversized excavation. All casings shall be removed from shaft excavations. Permanent steel casings shall not be used.

**D. Slurry**

Use of slurry shall not be permitted.

**III. CONTRACTOR QUALIFICATIONS**

This work shall be performed under the supervision of the contractor's superintendent, who will be fully knowledgeable and experienced, as defined herein, in the construction of drilled shaft foundations of similar sized shafts and geotechnical conditions using both cased and slurry methods. Further, the Contractor and the Contractor's superintendent performing the work shall have at least five years previous experience within the last eight years constructing drilled shafts, with at least two years at the current firm. The Contractor's equipment shall have the capacity to undertake the work and shall be sufficient to complete the work within the specified contract time.

The Contractor shall provide documentation of his qualifications, experience record, prior project references, and the availability of the equipment needed to perform the required work. All prior project references shall be currently available personnel who can verify the quality of the contractor's previous work and shall include current name, address, and telephone number. This documentation shall reference the experience of the drilled shaft contractor and the drilled shaft contractor's superintendent in responsible charge of the drilled shaft operations. This documentation shall reference successful construction of similar sized shafts in the following conditions:

- a) Experience in successfully installing drilled shafts of the size shown in the plans. The minimum experience shall consist of ten similar-sized projects in the past five years. Descriptions of projects must include a point of contact with the owner that is familiar with the project.
- b) Experience in cleaning shaft bottoms when working under wet conditions.

**IV. EQUIPMENT**

The Contractor shall furnish all equipment and instrumentation necessary for installation of the shafts.

The excavation and drilling equipment shall have adequate capacity including power, torque, and down thrust to excavate a hole of the maximum diameter shown on the plans and to a depth of 15-feet or 20 percent beyond the depths shown in the contract documents, whichever is greater.

The excavation and tools shall be of adequate design, size, and strength to perform the work shown in the contract documents or described herein. When the material encountered cannot be drilled using conventional earth augers with soil or rock teeth, drilling buckets, and/or over-reaming tools, the Contractor shall provide special drilling equipment including but not limited to: rock core barrels, rock tools, air tools, blasting materials, and other equipment as necessary to construct the shaft excavation to the size and depth required. Approval of the Engineer is required before excavation by blasting is permitted.

Provide a descriptive listing of available equipment that is fully capable of cleaning shaft bottoms when shafts are excavated under wet conditions.

**V. SITE INFORMATION**

Test Boring Log sheets are included in the contract documents for use by the Contractor. Data on subsurface conditions is not intended as representations or warranties of continuity of such conditions. It is expressly understood that the Department will not be responsible for interpretations or conclusions drawn there from by the Contractor. The data is made available for the convenience of the Contractor. The Contractor may make additional test borings and other exploratory operations at no additional cost to the Department.

Three separate geotechnical data reports titled Delaware Turnpike Improvements, Report No.1 Mainline Improvements, dated September 26, 2005, Delaware Turnpike Improvements, Report No. 2 SR1 Interchange, dated September 26, 2005 and Delaware Turnpike Improvements Report No.4 Northbound Widening dated June 21, 2005 have also been prepared by RK&K for this project. These reports were prepared to establish design guidelines only and should not be considered

part of the contract documents nor as a warranty of subsurface conditions. These reports may not be sufficient for use by specialty contractors. Contractors or prospective bidders may contact the Delaware Department of Transportation to review a copy of these reports.

## **VI. SUBMITTALS**

The Contractor shall submit to the Engineer for review and approval, an installation plan for the construction of drilled shafts not less than thirty days before the start of work as detailed in this Special Provision. The submittal shall include the following:

- A. List of proposed equipment to be used including cranes, drills, augers, bailing buckets, final cleaning equipment, tremie or concrete pumps, casing, and other appurtenances.
- B. Details of overall construction operation sequence and the sequence of shaft construction in bents or groups, including scaled plan and profile showing the location, size and movements of equipment setup and operations. The completion of any required integrity and loading tests shall be noted in this construction operation sequence.
- C. Submit project experience and resumes in accordance with Section III.- Contractor Qualification.
- D. Details of shaft excavation and stabilization methods.
- E. Method of monitoring verticality of the shaft excavation during excavation and details of proposed corrective measures to be implemented as necessary.
- F. Very specific details of methods to clean the shaft excavation. Details shall include at least three alternative bottom cleaning methods with descriptions of equipment to be used when installing drilled shafts with wet methods. Include details of method for identifying type of bearing material for consistency with design assumptions prior to placement of concrete.
- G. Details of reinforcement placement including support and centralization methods.
- H. The concrete mix design, including admixtures to be used. Details of concrete placement, curing, and protection.
- I. A copy of the proposed report format for planned shaft inspections. Record information for each shaft and details of any required load or integrity tests.
- J. Other information shown on the plans or requested by the Engineer.

The Contractor will not be permitted to start construction of any drilled shaft, until the complete installation plan submittal as described above has been received, reviewed and written approval to begin construction has been issued by the Engineer.

The Contractor will not be permitted to start the construction of drilled shafts for which working drawings are required until the Engineer has approved such drawings. Such approval will not relieve the Contractor of responsibility for results obtained by the use of these drawings or any of his other responsibilities under the contract.

Submittals during construction shall include record information for each shaft and details of any required loading or integrity tests as required.

## **VII. CONSTRUCTION METHODS**

### **A. Protection of Existing Structures**

All reasonable precautions shall be taken to prevent damage to all existing structures, utilities, and the public. These measures shall include but are not limited to, selecting construction methods and procedures that will prevent excessive

caving of the shaft excavation, monitoring, and controlling the vibrations from the driving of casing or sheeting, drilling of the shaft, or from blasting, if permitted. The Contractor shall verify that there are no subsurface utilities in close proximity of each shaft before beginning excavation activities.

## **B. Construction Sequence**

Where drilled shafts are to be installed in conjunction with embankment placement, they shall be constructed after the placement of the fill.

Excavation of adjacent drilled shafts or other structures or utilities within a radius of three shaft diameters will not be permitted until concrete has been in place for at least 48 hours.

## **C. Methods of Construction**

Excavations required for shafts shall be performed through whatever materials are encountered, to the dimensions and elevations shown on the plans or otherwise required by the Standard Specifications and Special Provisions. The method used shall be suitable for the intended purpose and materials encountered. The dry method or temporary casing method will be used as necessary to produce sound, durable concrete foundation shafts that are free of any defects. Wet method may only be used after the Engineers approval. The Engineer shall only permit blasting if specifically stated in the contract documents or authorized in writing. When a particular method of construction is required in the contract documents, that method shall be used. If no particular method is specified for use, the Contractor shall select and use the method, as determined by site conditions, subject to approval of the Engineer, which is needed to properly accomplish the work.

All shafts shall extend and bear approximately one-half diameter into rock except those shafts noted on the plans that terminate and bear in decomposed rock. In the event competent bedrock is not encountered during the drilled shaft excavation, the shaft shall be extended to bear at lower level elevations as determined by the Engineer. The estimated lengths shown on the plans and in the geotechnical reports should be considered approximate. Additional shaft lengths might be required depending on actual subsurface conditions. Shorter shaft lengths than indicated on the plans or in the geotechnical reports may only be constructed with the written approval of the Engineer.

### **1. Dry Construction Method**

The dry construction method shall be used only at sites where the ground-water table and site conditions are suitable to permit construction of the shaft in a relatively dry excavation (i.e., less than 3-inch of water accumulates above the final base elevation over a one-hour period when no pumping is permitted), and where the sides and bottom of the shaft are stable and may be visually inspected prior to placing the concrete.

The dry method consists of drilling the shaft excavation, removing accumulated water and loose material from the excavation, placing temporary casing, inspecting the bearing stratum, removing temporary casing, placing the reinforcing steel if required, and placing the shaft concrete in a relatively dry excavation. If caving occurs or if there is excess seepage into the drilled shaft, the drilling should be continued using a casing to maintain the integrity of the hole. Concrete shall be placed in accordance with Section VII.I.

### **2. Wet Construction Method**

The wet construction method shall not be used.

### **3. Temporary Casing Construction Method**

The temporary casing construction method shall be used at all sites where excessive caving or seepage could occur. When a nearly impervious formation is reached, a temporary casing shall be placed in the hole and sealed in the nearly impervious formation. As an alternative to use of the wet excavation method, temporary casing may be installed by drilling, driving, or vibratory procedures in advance of excavation to the lower limits of the caving material. Slurry may not be considered. Significant caving shall be considered to be more than 50% increased volume over theoretical shaft volume, for a section exceeding 10-feet of shaft. Casing shall be installed to the final base elevation to allow inspection of the bearing stratum.

After the reinforcing steel cage has been placed, fill the excavation with concrete. Before the casing is withdrawn and while the casing is being withdrawn, the level of fresh concrete in the casing shall be at such a level that all the fluid trapped behind the casing is displaced upward without contaminating the shaft concrete. Placement of the concrete and pulling of the temporary casing shall be conducted in accordance with Sections VII.I and VII.J.

#### **4. Alternative Construction Methods**

The Contractor may propose alternative methods to prevent caving and control ground water. Such proposals, accompanied by supporting technical data, shall be submitted in accordance with Section VI, Submittals. Written approval from the Engineer is required before the use of alternative construction methods.

#### **D. Excavations**

The bottom elevation of drilled shafts shown on the plans may be adjusted during construction if the Engineer determines that the foundation material encountered during excavation is unsuitable or differs from that anticipated in the design of the drilled shaft. The Contractor shall take soil samples when shown on the plans or as directed by the Engineer to determine the character of the material directly below the shaft excavation. The Engineer will inspect the samples or cores and determine the final depth of required shaft excavation.

The Contractor shall maintain a construction method log during shaft excavation. The log shall contain information such as the description and approximate top and bottom elevation of each soil or rock material, seepage or groundwater, and remarks.

Excavated materials, which are removed from the shaft excavation and any drilling fluids used, shall be disposed of off site in accordance with local environmental regulations and the contract documents or as directed by the Engineer.

##### **1. Unclassified Excavation**

Drilled shaft excavation is designated as unclassified; the Contractor shall provide the necessary equipment to remove and dispose of any materials encountered in forming the drilled shaft excavation to the dimensions shown on the plans or as directed by the Engineer. No separate payment will be made for excavation of materials of different densities and character.

The Contractor shall provide tools such as augers fitted with either soil or rock teeth, and drilling buckets attached to drilling equipment of the size, power, torque, and down thrust approved for use by the Engineer. Material normally classified as decomposed rock, weathered, rock, disintegrated rock, or rock shall be considered as unclassified excavation. The Contractor shall provide appropriate tools such as, but not limited to, equipment listed in Section IV of these provisions in order to install the drilled shafts to their design depths.

#### **E. Obstructions**

The Contractor shall remove surface and subsurface obstructions at drilled shaft locations. Such obstructions may include man-made materials, such as old concrete foundations, and natural materials, such as boulders. Boulders are defined as stones with a least dimension greater than 1-foot. Special tools and/or procedures shall be employed by the Contractor after the hole cannot be advanced more than 1-foot in thirty minutes using approved equipment operating at maximum power, torque, and down thrust, using conventional augers fitted with soil or rock teeth, drilling buckets, and/or under-reaming tools. Such special procedures/tools may include but are not limited to: chisels, boulder breakers, core barrels, air tools, hand excavation, temporary casing, and increasing hole diameter. Blasting shall not be permitted unless specifically approved in writing by the Engineer.

#### **F. Lost Tools**

Drilling tools that are lost in the excavation shall not be considered obstructions and shall be promptly removed by the Contractor without compensation. All costs due to lost tool removal shall be borne by the Contractor including but not limited to costs associated with hole degradation due to removal operations or the time the hole remains open.

**G. Excavation Inspection**

The Contractor shall provide details of shaft construction to the Engineer for review. The Contractor shall provide equipment for checking the dimensions and alignment of each shaft excavation. The Contractor shall determine the shaft dimensions and alignment under the observation and/or direction of the Engineer. Final shaft depth shall be measured after final cleaning.

Shaft cleanliness and the bearing surface condition will be evaluated and approved by the Engineer. The Contractor shall provide safe access and egress to the Engineer for inspection of the bottom of the excavation prior to placement of reinforcing steel and concrete. After the Contractor has prepared the bottom of the shaft excavation, the Contractor shall notify the Engineer. The Contractor shall coordinate schedules for excavation inspection by the Engineer.

The Contractor shall not permit any worker to enter the shaft excavation for any reason unless: both a suitable casing has been installed and the water level has been lowered and stabilized below the level to be occupied, and adequate safety equipment and procedures have been provided to workers entering the excavation. The Contractor shall follow OSHA guidelines for confined space entry.

Prior to placement of reinforcing steel and concrete, the Contractor shall ensure that loose material from the bottom and sides of excavation have been removed and that shaft is within the specified tolerances. Specified tolerances are listed in Section VII.K of this Special Provision. The shaft excavation shall be cleaned to remove all accumulated sediment and water.

The Contractor shall be responsible for correcting drilled shafts that are not constructed within the specified tolerances. Remedial measures, including engineering analysis and redesign, to correct for out-of-tolerance drilled shaft foundations, shall be performed at no additional cost to the Department.

**H. Reinforcing Steel Cage Construction and Placement**

The reinforcing steel cage consisting of the steel shown on the plans plus cage stiffener bars, spacers, centralizers, and other necessary appurtenances shall be completely assembled and placed as a unit immediately after the shaft excavation is inspected and accepted and prior to shaft concrete placement. Prior to installation of the steel cage in the shaft excavation, inspect and clean the reinforcing steel of materials that prevent effective bonding. Clear spacing between bars of the rebar cage shall be at least five times the size of the maximum coarse aggregate. Hooks at the top of the rebar cage shall not be bent outward if temporary casing will be used. Similarly, interior hooks must be designed to permit adequate clearance for a concrete tremie pipe (i.e., 12-inch minimum), if concrete is to be tremied into place. Where clearance is a problem, hooks may be placed on dowels that may be rotated after concrete placement or casing removal and repositioned after the tremie is removed. The concrete must remain fluid during dowel repositioning. Shafts that require a large amount of reinforcing steel shall use bundled longitudinal bars to maintain the minimum clear spacing requirement. The assembled rebar cage outside diameter shall be at least 6-inches smaller than the drilled hole diameter, which corresponds to at least 3-inches of concrete cover over the rebar on all sides.

The reinforcing steel in the shaft shall be tied and supported so that the reinforcing steel will remain within allowable tolerances until the concrete will support the reinforcing steel. When concrete is placed by tremie methods, temporary hold-down devices shall be used to prevent uplifting of the steel cage during concrete placement. Concrete spacers or other approved noncorrosive spacing devices shall be used at sufficient intervals not exceeding 5-feet along the shaft excavation. At least three spacers shall be evenly distributed around the circumference of the reinforcing steel at each elevation where used.

**I. Concrete Placement, Curing, and Protection**

All concrete placement, consolidation and curing activities shall conform to the recommendations of Section 602 and 812, of the Standard Specifications, except as otherwise specified herein.

Concrete shall be placed as soon as possible after reinforcing steel cage placement. Concrete placement shall be continuous in the shaft to the top elevation of the shaft. Placement shall continue after the shaft is full until good quality

concrete is evident at the top of the shaft.

Concrete to be placed in dry shafts less than 100-feet in length may be placed by allowing the concrete to free fall into the excavation. This is subject to performance satisfactory to the Engineer during construction. Limit the segregation of the concrete by placing the concrete through the use of a centering tube, sectionalized pipe or other means to direct the free fall of the concrete so that it does not strike the sides or reinforcement of the shaft. If water has infiltrated the base of the excavation, it shall be removed prior to placement of the concrete. No more than 1-inch of standing water shall be allowed in the base of an excavation at the time of concrete placement to prevent segregation of the concrete. The Engineer shall have the final decision as to the allowable amount of water in the base of the excavation. The Engineer may require the Contractor to have a small sump pit in the base of the excavation to allow removal of any accumulated water.

Concrete to be placed in water shall be placed through a tremie or concrete pump. The tremie shall be supported so as to permit free movement or permit rapid lowering when necessary to retard or stop the flow of concrete. The discharge end shall be sealed closed at the start of work so as to prevent water or slurry from entering the tube before the tube is filled with concrete. After placement has started the tremie tube shall be kept full of concrete to the bottom of the hopper. If water enters the tube after placement is started, the tremie shall be withdrawn, the discharge end resealed, and the placement restarted. The flow of concrete shall be continuous until the work is completed. The discharge end of the tremie shall always be located a minimum of 5-feet below the level of the already placed concrete. As concrete is placed in the excavation, the slurry shall be collected and properly disposed of as approved by the Engineer.

Tremie pipes shall be a minimum of 10-inch diameter. Tremie pipes shall not have aluminum parts that will react with concrete. Pump hoses shall be a minimum of 4-inch diameter. All tremie pipe or pump hoses and connections shall be watertight.

The concrete placing rate shall be not less than 30 cubic yards of concrete per each one-hour period. The concrete mix shall be of such design that the concrete remains in workable plastic state throughout the placement of the concrete for the entire drilled shaft.

All concrete, except for that placed under water, shall be vibrated to a depth of 5-feet below the ground surface except where soft uncased soil remaining in the excavation will possibly mix with the concrete. After placement, any exposed surfaces of the shaft concrete shall be protected to allow proper curing.

For at least forty-eight hours after shaft concrete has been placed, no construction operations that will cause soil movement adjacent to the shaft, other than mild vibration, shall be conducted.

## **J. Casings and Forms**

When the shaft extends above ground or through a body of water, the portion of the shaft exposed above ground or through a body of water may be formed with removable concrete forms except when a permanent form is specified. Removable forms shall be stripped from the shaft in a manner that will not damage the concrete. Forms can be removed when the concrete has attained sufficient strength provided: curing of the concrete is continued for the full seventy-two-hour period in accordance with the specifications and the concrete has reached 75-percent of its design compressive strength as determined from concrete cylinder breaks.

Temporary casings shall be removed while the concrete remains workable. The removal of temporary casing shall not be allowed until the level of the concrete placed in the shaft is great enough to withstand the pressure exerted by the surrounding soil, water or drilling fluid. After concreting begins, removal of the casing should begin within one hour, before the concrete begins to set. Telescoping casing may be used but the bottom end of the temporary casing shall be located a minimum of 5-ft below the level of already placed concrete. If the concrete begins to set prior to removal of the casing, the removal of the casing should cease, and the casing should be cut off at its current elevation and remain in the ground permanently. No payment shall be given for any casing not retrieved.

Movement of the casing by rotating, exerting downward pressure and tapping to facilitate extraction or extraction with a vibratory hammer will not be permitted. Casing extraction shall be at a slow, uniform rate with the pull in line with the shaft axis. Do not damage or displace reinforcing cage when withdrawing casing.

**K. Construction Tolerances**

The following construction tolerances shall be maintained in constructing drilled shafts.

1. The center of the drilled shaft shall be within 3-inches of the plan position in the horizontal plane at the plan elevation for the top of the shaft.
2. The vertical alignment of the shaft excavation shall not vary from the plan alignment by more than 0.25-inch per foot.
3. After all the shaft concrete is placed; the top of the reinforcing steel cage shall be no more than 6-inches above and no more than 3-inches below plan position.
4. When casing is used, the inside diameter of the casing shall not be less than the shaft diameter shown on the plans. When casing is not used, the minimum diameter of the drilled shaft shall not be more than 1-inch less than the diameter shown on the plans.
5. The top elevation of the shaft shall be within 1-inch of the plan top of shaft elevation.
6. The bottom of the shaft excavation shall be normal to the axis of the shaft within 1-inch per foot of shaft diameter.
7. The reinforcing steel shall be placed so that the outer edges of the reinforcing cage are located uniformly a minimum of 3-inches inside the perimeter of the design shaft size.

Drilled shaft excavations constructed in such a manner that the concrete shaft cannot be completed within the required tolerances are unacceptable. Correction methods shall be submitted by the Contractor for the Engineer's approval. Approval will be obtained before continuing with the drilled shaft construction. Materials, engineering and work necessary to effect correction for out-of-tolerance drilled shaft excavations shall be furnished at no cost to the Department.

**L. Record Information**

The Contractor shall provide the following minimum record Information. For each drilled shaft foundation installed, record on drilled shaft installation logs the location, alignment, dimensions, elevation of the top and bottom, depth of the bearing stratum penetration, description of the materials encountered at all elevations, elevation of the water table during excavation, condition of the bottom of the excavation, slurry test data, concrete data, verticality and deviation of shaft or reinforcing steel from the plan location, and other data called for on the report form or pertinent to the drilled shaft. Record the theoretical volume of excavation, volume of concrete placed versus depth, and total volume of concrete placed. Report observed irregularities to the Engineer within eight hours of discovery.

Minimum Record Information shall be in accordance with FHWA Publication No. IF-99-025 "Drilled Shafts" or Association of Drilled Shaft Contractors' "Drilled Shaft Inspector's Manual" (1989). A copy of the inspection report planned for use shall be submitted to the Engineer for approval. Submit draft record information for each completed shaft to the Engineer within twenty-four hours of completion. Submit final record drawings of each drilled shaft installed no more than three weeks after completion of the work. Submit records on a weekly basis, or more frequently if variation occurs.

**M. Site Operations**

The Contractor shall conduct his operations in a neat and orderly manner. Equipment and materials shall not be placed or stored beyond limits approved by the Engineer and shall promptly be removed when no longer needed. All materials, water, slurry, and auger cuttings shall be confined to the specified work area so as not to migrate from the specified work area.

**N. Construction Adjacent to Freshly Drilled Shafts**

No construction activity, including drilling, within a radius of three shaft diameters of a freshly drilled shaft shall take place until the concrete shaft has cured for at least twenty-four hours and the Engineer has provided written approval.

**Method of Measurement:**

The quantity of box truss type overhead sign supports and foundations will not be measured, but will be paid for at the contract lump sum price bid for "Box Truss Type Overhead Sign Supports and Foundations."

**Basis of Payment:**

The payment for the item "Box Truss Type Overhead Sign Supports and Foundations" as called for by the contract shall be made at the contract price(s) bid per Lump Sum complete in place and accepted, which price and payment will constitute full compensation for furnishing and fabricating and placing all materials, clearing and grubbing the areas, normal excavation in accordance with Section 207, concrete and reinforcing bars, construction of foundations, backfilling and compaction, grading, sodding if required to restore the site to its original condition or as required by the Plan, and for all labor, equipment, tools and incidentals necessary to complete the work. Payment for Borrow Type C shall be made under separate item of this Contract. If obstruction removal/excavation is encountered, including rock excavation, payment shall be made at a fixed price of \$150.00 per cubic yard for a quantity up to and including 15 cubic yards. For quantity exceeding 15 cubic yards (meters), the unit price shall be negotiated with the Contractor.

**NOTE**

Since more than one structure is required, the Contractor shall submit a cost breakdown of his Lump Sum price bid for this item showing the dollar value amount for each box truss type overhead sign support structure with foundation, the sum of which to equal the lump sum price bid.

The Department reserves the right to delete from the Contract, construction of one or more individual sign structure(s), and the lump sum price to be paid will be reduced in accordance with the Contractor's itemized bid price list for that individual sign structure. There shall be no extra compensation to the Contractor if such deletion is made.

4/6/11

**619501 - PRODUCTION PILE RESTRIKE**  
**619502 - TEST PILE RESTRIKE****Description:**

Under certain pile driving conditions it may become necessary to restrike various production piles and test piles, of the sizes and type called for by the Contract, in order to verify the pile capacities. Some of the pile driving conditions that could result in the need for pile restrikes include; bearing capacities are not achieved by the initial driving, Contract Plans for driving based on tip elevation (bearing achieved by freeze), and dynamic analysis procedures require extended waiting times for restrike.

**Note:** These Special Provisions replace Subsection 619.14 of the Standard Specifications.

**Procedure:**

All test piles shall be restruck and dynamically tested by the Contractor. The Engineer may direct the Contractor to restrike selected production piles to verify capacities.

-The Engineer will attempt to schedule the pile restrike so as to cause minimal, if any, delay to the overall driving operation.

-Prior to restrike, the Contractor shall mark the pile in 1-inch increments for the first 1-foot and 1-foot increments thereafter. The pile restrikes shall be in accordance with the plans.

-All restrikes shall be performed using the same pile hammer, helmet, and cushion material used to install the piles during initial driving.

-The pile hammer shall be fully warmed up and operated at full stroke, or as otherwise specified by the Engineer, during the pile restrike. The warm-up procedure shall consist of a minimum of 25 blows of the hammer at full stroke at locations other than the piles to be restruck.

-The elevation of the top of the pile shall be established prior to performing the restrike.

-The hammer shall be carefully lowered and positioned on the pile. The hammer shall restrike the pile 20 blows at the required stroke height.

-The hammer shall be removed from the pile, and the new top of the pile elevation shall be established.

If for any reason, the pile hammer malfunctions, the helmet fails, the cushioning materials fail, or any other component of the pile driving system does not function properly during the pile restrike, the Contractor shall wait up to two (2) calendar days and perform additional restrikes at no additional cost to the Engineer or The Department until the pile driving system operates properly through a complete continuous restrike procedure.

**Method of Measurement/Basis of Payment:****Production Pile Restrike:**

This item shall be measured and paid for on a per each basis and payment will constitute full compensation for performing restrikes of selected production piles. The Engineer will work jointly with the Contractor to establish a sequencing of production pile restrikes to minimize impact to the Contractor's driving schedule. Any perceived mobilization costs, set-up costs, delay costs, etc. anticipated by the Contractor shall be incidental to the price for this item.

Payment for "Production Pile Restrikes" shall be made at the fixed price of \$500.00 Each if it is requested by the Department within five (5) working days of the completion of the initial driving of the pile to be restruck. Payment for "Production Pile Restrikes" with requested restrike wait time exceeding five (5) working days will be made at the fixed price of \$500.00 Each for each working day exceeded, starting on the sixth day, in addition to the fixed price of \$500.00 Each. An example of this case would be, if the Engineer directs a production pile restrike to be performed six (6) working days following the completion of the initial driving, two (2) units will be paid. Similarly, if the restrike is ordered to be performed eight (8) working days following the completion of the initial driving, four (4) units will be paid. No payment will be made for additional days if the Contractor elects to wait longer to perform the restrike than the time frame as directed by the Engineer. Any overlapping days due to multiple production piles will be paid for only one day.

**Test Pile Restrike:**

This item will be measured on an Each Day basis. Test pile restrikes will not be paid for under this item unless the restrike waiting time is greater than five (5) working days following the completion of the initial driving. All test pile restrikes requested by the Department within the first five (5) working days following the completion of the initial driving shall be incidental to the installation of the test pile. An example of this case would be, if the Engineer directs a test pile restrike to be performed six (6) working days following the completion of the initial driving, one (1) unit will be paid. Similarly, if the restrike is ordered to be performed eight (8) working days following the completion of the initial driving, three (3) units will be paid. No payment will be made for additional days if the Contractor elects to wait longer to perform the restrike than the time frame as directed by the Engineer.

Payment for "Test Pile Restrike" on test piles with requested restrike wait time exceeding five (5) working days will be made at the fixed price of \$1,000.00 per Each Day. Any overlapping days due to multiple test piles will be paid for only one day.

Price and payment will constitute full compensation for all equipment, labor and materials necessary to perform a Test Pile Restrike as described above. Also included in the payment is the cost of any idle equipment, labor, etc. during the prescribed waiting period between initial driving and performance of the restrike.

4/29/11

**619519 – DYNAMIC PILE TESTING BY CONTRACTOR**  
**619539 – SIGNAL MATCHING ANALYSIS BY CONTRACTOR**

**Description:**

This item shall consist of furnishing all materials, equipment, access, reporting of results, and qualified personnel necessary to perform all wave equation analysis, high-strain dynamic testing and signal matching, and monitoring of driven piles at the locations designated on the Plans or as directed by the Engineer. The work shall also include analysis and report preparation in accordance with this Special Provision.

High-strain dynamic testing and signal matching shall be performed on all test piles for the entire duration of the test pile installation, re-strikes, and as indicated in the Plans.

The Contractor shall notify the Engineer of the proposed pile driving schedule at least two working days prior to driving piles at any location where high-strain dynamic testing will be conducted.

**Submittals:**

The Contractor shall engage the services of a specialty subcontractor, the Dynamic Testing Consultant (DTC), experienced in high-strain dynamic monitoring of driven piles to perform dynamic testing and signal matching analysis and to evaluate and report results to the Department. The Dynamic Testing Consultant shall have at least five (5) years of documented experience in the performance and interpretation of dynamic pile testing, including dynamic pile testing on open ended pipe piles. The Dynamic Testing Consultant's field engineer or technician, who will be operating the instrumentation and collecting the data, shall have documented experience on at least ten (10) prior projects with similar pile requirements, including pipe piles. All projects submitted as evidence of experience shall include the client and owner, points of contact, and a description of the pile type. The field engineer or technician responsible for operating the instrumentation shall be fully capable of understanding and interpreting the data being collected during driving. The Dynamic Testing Consultant shall be selected by the Contractor and submitted at the pre-construction meeting for approval by the Department.

a. Qualifying Experience

The Contractor shall submit proof of three or more projects of similar size and complexity where the DTC and personnel assigned to this project have successfully performed similar services and analyses within the last three years. The Contractor shall present the following information for each project listed as a reference at or prior to any preconstruction meetings:

1. Project Name, Location, Project Description, and Completion Date.
2. Surface and Subsurface Conditions.
3. Type and number of instruments installed.
4. Installation equipment and techniques utilized when applicable.
5. Provide names, current phone numbers, and current business addresses for the owner/designer, geotechnical consultant, and contract manager.

b. Wave Equation Analysis

The Contractor shall submit the completed Pile and Driving Equipment data form to the Department 30 to 45-days before mobilization to the site. The wave equation analysis of the proposed driving system shall be submitted to the Department at least 10-days prior to driving of the piles. The results of the wave equation analysis using the GRLWEAP program or other software approved by the Department shall be submitted in a bound report for review and approval. The wave equation analysis shall be performed at each test pile location and for each test pile type and driving equipment. Approval of the proposed driving system by the Department will be based on DelDOT Standard Specifications for Road and Bridge Construction, 2001, Section 619.09, Bearing Values.

c. Reports

The Dynamic Testing Consultant shall direct the progress of the testing work and shall obtain and record the test data. The Dynamic Testing Consultant shall prepare a daily field report summarizing the high-strain dynamic test results and pile driving data. At a minimum, the daily report shall include the calculated driving stresses, transferred energy, and estimated pile capacity at the time of testing. Pile driving logs shall be included with the submittal. Variations from previous trends in the dynamic test data shall also be noted. Daily field reports shall be faxed or transmitted electronically to the Engineer within 24-hours of the end of the shift.

The Dynamic Testing Consultant shall prepare a written report presenting the results of the pile program in accordance with the requirements of ASTM D4945 including specific discussion of the pile capacity obtained from the dynamic testing, the performance of the hammer and driving system, driving stress levels, and pile integrity. The following data shall also be provided in the report for the full length of driving at intervals of not more than 10 hammer blows: bearing capacity from the Case Goble method, bearing capacity from at least one additional recognized method, input and reflection values of force and velocity, maximum transferred energy, maximum compressive stress, maximum tensile stress, blows per minute, values of upward and downward traveling force wave, ram stroke, pile penetration depth and corresponding blow sequence.

Signal matching analyses shall be performed for all initial drives and restrikes of dynamically tested piles. A minimum of one (1) signal matching analysis shall be performed for a representative blow near the end of each initial drive and a minimum of one (1) representative blows shall be analyzed towards the beginning of the restrike.

Within three (3) working days of the completion of each dynamic test, the Contractor's specialty subcontractor shall submit to the Department a report meeting the requirements of this Special Provision that is signed and sealed by a Professional Engineer licensed in the State of Delaware. In addition to the raw data and ASTM D4945 requirements, the report shall include detailed results of the signal matching analyses including, but not limited to, pile driving log, all extrema tables; pile profile and pile model tables; simulated load test curves for the tip and top of the pile; the soil parameters used in the analysis by matching the measured and computed values of forces, velocities, and displacements; and static resistance distribution along the length of the pile, in a format approved by the Department. The Contractor is to develop the driving criteria for the production piles based on the results of the high strain dynamic testing with signal matching analysis. The Contractor shall submit the driving criteria for review and approval of the Engineer prior to installation of production piles. The driving criteria shall be summarized in the format provided by the Engineer after award of the contract.

All raw data and computer analyses shall be provided in electronic format to the Department for additional analysis.

**Materials and Construction Methods:**

All equipment, testing and reporting procedures shall be provided and performed in strict accordance with ASTM D4945 - *Standard Test Method for High-Strain Dynamic Testing of Piles*.

The Contractor shall maintain a stock of at least four working accelerometers and strain transducers at the job site whenever high-strain testing is being performed. All repair or replacement costs shall be performed at no additional cost to the Engineer or The Department.

The Contractor shall provide the Engineer and The Department reasonable inspection access along the full length and circumference of all piles prepared for instrumentation attachment prior to the piles being lifted and located in the leads.

Dynamic monitoring instrumentation, including all gages and cables, shall not be installed on the pile until the pile has been lifted and aligned in the leads and the hammer and helmet have been properly set.

The Dynamic Testing Consultant shall perform dynamic testing during the entire initial drive and restrike of all piles so designated on the Plans or as otherwise directed by the Engineer or The Department. The dynamic testing firm shall continuously monitor the tensile and compressive stresses during driving to ensure that the permissible stress limits provided by the Engineer are not exceeded during driving. Should the driving operation result in stresses that approach or exceed the permissible limits, the dynamic testing firm's equipment operator shall immediately have the hammer stroke reduced or the driving operation stopped in order to prevent pile damage. If non-axial driving is indicated by dynamic test measurements, pile driving shall be stopped immediately and the Contractor shall realign the driving system or take other corrective action, as necessary, before resuming driving.

If the top of pile is damaged or becomes deformed at any time during the dynamic testing of the piles, pile driving shall be stopped and the damaged area cut off in accordance with Section 619 of the Standard Specifications. The remaining pile section shall be properly prepared for gauge installation and inspected by the Department prior to the continuation of driving.

All dynamically tested piles shall be driven in accordance with the Plans. Should the field data indicate the hammer system is not transferring to the pile the full energy anticipated at the end of initial drive, the Contractor shall increase the hammer stroke and/or driving resistance until the minimum initial drive capacity is displayed on the dynamic testing apparatus. However, in no case shall the permissible stress limits be exceeded.

The Contractor shall maintain a minimum distance of 1-foot between the pile monitoring gages and the ground surface, water surface, or pile template. If additional ground penetration is required, the driving shall be halted, the gages removed and the pile spliced before proceeding with additional driving and monitoring. Prior to splicing, the pile splice segment shall be properly prepared for gage installation in accordance with ASTM D4945 and made accessible to the Department for inspection. After the pile has been properly spliced and the hammer and leads have been reset, the gages shall be reattached to the new pile segment and the drive continued.

Restriking of all test piles as indicated on the plans or directed by the Department shall be dynamically tested by the Contractor. Dynamic testing of production piles shall be at the request of the Department based on actual field conditions.

**Method of Measurement:**

High-Strain Dynamic Pile Testing by Contractor authorized and found acceptable by the Department will be measured on an Each basis upon receipt and acceptance of the associated dynamic testing report(s). Each initial drive and each restrike dynamically monitored by the Contractor shall be measured as separate units.

Signal Matching Analysis will be measured for at the Contract unit price per each.

**Basis of Payment:**

Payment for High-Strain Dynamic Pile Testing by Contractor authorized and found acceptable by the Department will be made at the Contract unit price per Each for Item 619519. Payment for Signal Matching Analysis by Contractor and found acceptable by the Engineer will be made at the Contract unit price per Each for Item 619539. The payment will also be full compensation for preparing the preconstruction wave equation analyses, and preparation of reports.

Price and Payment will constitute full compensation for furnishing tools, labor, specialty subcontractor, materials, equipment, analyses, reports, and incidental work required to perform high-strain dynamic pile testing during initial driving and restrikes including providing inspection access to the Engineer and the Department.

4/29/11

**720512 - P.C.C. SAFETY BARRIER PERMANENT, DOUBLE FACE**  
**720529 - P.C.C. SAFETY BARRIER PERMANENT, SINGLE FACE**  
**720587 - P.C.C. SAFETY BARRIER PERMANENT, DOUBLE FACE, MODIFIED**  
**720651 - P.C.C. SAFETY BARRIER PERMANENT, DOUBLE FACE BIFURCATED TYPE 1**  
**720652 - P.C.C. SAFETY BARRIER PERMANENT, DOUBLE FACE BIFURCATED TYPE 2**  
**720654 - P.C.C. SAFETY BARRIER PERMANENT, SINGLE FACE, MODIFIED TYPE 1**  
**720655 - P.C.C. SAFETY BARRIER PERMANENT, SINGLE FACE, MODIFIED TYPE 2**  
**720656 - P.C.C. SAFETY BARRIER PERMANENT, SINGLE FACE, MODIFIED TYPE 3**  
**720657 - P.C.C. SAFETY BARRIER PERMANENT, SINGLE FACE, MODIFIED TYPE 4**  
**720658 - P.C.C. SAFETY BARRIER PERMANENT, SINGLE FACE, MODIFIED TYPE 5**

**Description:**

This work consists of furnishing all materials and constructing permanent portland cement concrete safety barrier in accordance with the locations, details, and notes shown on the Plans, and/or as directed by the Engineer.

**Materials:**

Material shall conform to the requirements listed on the Plans, and as noted herein. Portland cement concrete shall be 4500 psi (30 MPa) minimum and shall conform to the material requirements of Class A, Section 812, Portland Cement Concrete of the Standard Specifications.

Bar reinforcement shall be epoxy coated meeting the requirements of Section 604 Grade 60 (Grade 400).

Waterproofing membrane shall conform to the material requirements of Section 808 of the Standard Specifications.

**Construction Methods:**

Construction methods shall conform with the applicable subsections of Sections 602 and 603 of the Standard Specifications, and details shown on the Plans.

The Contractor shall have the option of constructing the permanent safety barriers by selecting Cast-In-Place, or Pre-Cast, or Slip-form methods. The Contractor shall submit his/her plans for the selected method to the Department's Materials and Research Section for approval. In case of selecting the Slip-form method, the Contractor shall be able to demonstrate his/her ability to successfully accomplish the item by his/her past involvement in doing such work. Slip-form plans shall show the sawing of 3" (75 mm) deep contraction joints every 10' - 20' (3 m - 6 m) as determined by the Engineer. The joints shall be sawed within 2-24 hours after placement of concrete depending upon the weather conditions.

**Method of Measurement:**

The quantity of permanent portland cement safety barrier will be measured by the linear foot (linear meter) along the toe of the barrier, installed in place and accepted.

**Basis of Payment:**

The quantity of portland cement safety barrier will be paid for at the Contract unit price per linear foot (linear meter) for each type of barrier. Price and payment will constitute full compensation for all material, formwork, sawing of joints, reinforcement bars, geotextile, backfill, drainage appurtenances, joint material, waterproofing membrane and concrete all complete in place and accepted, for all labor, equipment, tools and incidentals necessary to complete the work. Payment for this item includes excavation and the P.C.C. footer portion of the barrier included in this item.

4/6/11

**720532 - INSTALL PORTABLE IMPACT ATTENUATOR**  
**720534 - FURNISH PORTABLE IMPACT ATTENUATOR**  
**720539 - RELOCATE PORTABLE IMPACT ATTENUATOR**

**Description:**

Work under these items shall consist of furnishing, installing, maintaining, repairing, and relocating portable impact attenuators under the proper item(s) as required to protect the various construction work zones in accordance with these specifications and/or as directed by the engineer in the field.

**Materials:**

The impact attenuator shall be an energy-absorbing, non-gating, redirection device meeting the requirements of the NCHRP Report 350, Test Level 3. The configuration of the device shall be as specified (in published literature) by the manufacturer for the design speed indicated on the Plans. Dimensional requirements, if any, shall be as noted on the Plans.

No system that requires removal from site for repairs shall be accepted.

**Construction Methods:**

Installation of the attenuator system shall be accomplished by experienced workmen in accordance with the manufacturer's recommendations. The Contractor shall provide written certification that the impact attenuator has been properly installed. Such certification shall be to insure that the attenuator system device is crash-worthy according to the manufacturer's current specifications. Certification must be provided within 24 hours of the installation of the attenuator system.

Each attenuator system must be re-inspected and recertified after relocation.

The Contractor shall furnish (720534), install (720532) and relocate (720539) the attenuator system in project locations in accordance with these specifications and/or as directed by the Engineer in the field. Additionally, the Contractor shall furnish (720534) two complete replacement (stand-by) attenuator systems and store on site. If an installed attenuator is damaged, requiring replacement, the Contractor shall remove the damaged attenuator, install (720532) the replacement (stand-by) attenuator, and re-order a replacement (stand-by) attenuator system to be furnished to the project site (720534). If additional replacement (stand-by) attenuator systems are required on this contract, the procedure for payment outlined above will continue to be followed.

The attenuator system shall be repaired or replaced within 24 hours of the time when the Contractor is notified. After repair or replacement is completed as described above, re-inspection and recertification is required. The Contractor shall provide a 24-hour emergency contact, specifically for the repair or replacement of the attenuator system. If the system has not been repaired or replaced within 24 hours of notification, a \$1000 per hour penalty will be charged for each hour over 24 hours that the attenuator system goes unreplaced or unrepaired.

When no longer needed on the contract, any undamaged attenuator system(s) and the stand-by system shall become the property of the Contractor. Damaged attenuators will become the property of the Contractor.

**Basis of Payment:**

The payment for this item as required by the contract shall be made for the actual number of “Furnish Portable Impact Attenuator” furnished at the unit price bid per each, the actual number of “Install Portable Impact Attenuator” installed at the unit price bid per each, and the actual number of relocations performed under the item “Relocate Portable Impact Attenuator”, as required and approved by the Engineer at the unit price bid per each relocation. The prices under these items shall constitute full compensation for furnishing, installing, maintaining, relocating, delivery to the site, removal from the site, all labor, equipment, tools, and incidentals necessary to complete the work. When attenuators are damaged by the public and replaced with a stand-by attenuator by the contractor, the replacement will be paid for as one (1) installation.

In the case of partial replacement or repair, the Contractor will make repairs in accordance with the manufacturer’s recommendations and will be paid at the unit price listed on the repaired/replaced part(s) portion of the “Install Portable Impact Attenuator” and “Furnish Portable Impact Attenuator” forms. The Contractor shall list all major components of Portable Impact Attenuator that can be repaired/replaced independently, according to the manufacturer’s recommendations, and the total number of each component(s) that is necessary to comprise one (1) complete Portable Impact Attenuator. The Contractor shall submit a unit price per each component(s) multiplied by the number of each component shown in the form, and the sum shall equal the total cost of one installed Portable Impact Attenuator and one furnished Portable Impact Attenuator, respectively. Price and payment for attenuator repairs will constitute full compensation for furnishing and installing all materials, removing and disposing of damaged material, and for all labor, equipment, tools, and incidentals required to complete the work.

All maintenance of traffic costs associated with portable impact attenuator replacement or repairs shall be paid for under the unit price bid for the respective maintenance of traffic items. Attenuators damaged by the Contractor shall be repaired or replaced at the Contractor’s expense.

4/29/11

**744500 - CONDUIT JUNCTION WELL, TYPE 6, 17" x 30" PRECAST POLYMER CONCRETE**  
**744506 - CONDUIT JUNCTION WELL, TYPE 7, 36" x 60" PRECAST POLYMER CONCRETE**  
**744507 - CONDUIT JUNCTION WELL, TYPE 8, 30" x 48" PRECAST POLYMER CONCRETE**  
**744509 - CONDUIT JUNCTION WELL, TYPE 10, 24" x 36" PRECAST POLYMER  
CONCRETE**  
**744520 - CONDUIT JUNCTION WELL, TYPE 1, 20" x 20" PRECAST CONCRETE**  
**744523 - CONDUIT JUNCTION WELL, TYPE 4, 20" x 42 1/2" PRECAST CONCRETE**  
**744524 - CONDUIT JUNCTION WELL, TYPE 5, 24" x 16" PRECAST CONCRETE**

**Description:**

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

**Materials:**

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

Castings shall conform to Section 708.05 of the Standard Specifications.

Frames and lids shall be in accordance with Sections 708 and 744 of the Standard Specifications. Provide suitable grounding lugs on all cast iron frames and covers.

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

Ground rods shall be 3/4 - inch in diameter by 10 feet long and shall be constructed of copper clad steel. Connections in junction wells shall be by suitable bolted ground connections.

#6 Bare Copper Wire

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

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

**Construction Methods:**

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

Electrical circuits shall be bonded and grounded in each junction well with metallic parts (cast iron lids, etc.). One ground rod shall be installed inside each conduit junction well, with the top of the ground rod exposed at the bottom of the junction well. Using the appropriate ground rod clamps, connect #6 ground wire to the ground rod. Extend #6 ground wire to grounding lugs on the cast iron frame and cover. Sufficient slack shall be left in ground wire to provide acceptable access to the junction well when the cover is removed. Connect equipment grounding wire to conduit bushings and ground rod inside the manhole.

**Method of Measurement:**

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

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

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

**Basis of Payment:**

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

4/6/11

- 746517 - ALUMINUM LIGHTING STANDARD WITH SINGLE DAVIT ARM, 30' POLE**
- 746518 - ALUMINUM LIGHTING STANDARD WITH SINGLE DAVIT ARM, 35' POLE**
- 746519 - ALUMINUM LIGHTING STANDARD WITH SINGLE DAVIT ARM, 40' POLE**
- 746520 - ALUMINUM LIGHTING STANDARD WITH DOUBLE DAVIT ARM, 30' POLE**
- 746521 - ALUMINUM LIGHTING STANDARD WITH DOUBLE DAVIT ARM, 35' POLE**
- 746522 - ALUMINUM LIGHTING STANDARD WITH DOUBLE DAVIT ARM, 40' POLE**
- 746618 - ALUMINUM LIGHTING STANDARD WITH SINGLE DAVIT ARM, 45' POLE**

**Description:**

The work consists of furnishing and installing Aluminum Lighting Standard with Single Davit Arm and/or Aluminum Lighting Standard Pole with Double Davit Arms, breakaway transformer base or anchor base, anchor bolts, luminaires, in accordance with the details on the Plans, and/or as directed by the Engineer to make a functional street lighting system. The foundation will be provided under other items in the contract.

**Materials and Construction Methods:**

All materials shall be of the best quality and free from all defects. No materials shall be installed until approved by the Engineer. Any material not specifically covered in these specifications shall be in accordance with accepted standards and as directed by the Engineer. Any materials deemed unsatisfactory by the Engineer, shall be replaced by the Contractor.

Lighting standards shall meet or exceed the requirements of the 2009 edition of AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals." Computations, signed and sealed by a professional engineer licensed in the State of Delaware, confirming conformance with AASHTO Specifications, with the year of the edition specified, shall be submitted to the Delaware Department of Transportation.

All electrical materials shall conform to the requirements of the National Electrical Code of the national Fire Protection Association, and shall conform to all local and special laws and/or ordinances governing such installations. Where these requirements do not govern, and where not otherwise specified, electrical materials shall conform to the Standardization Rules of the Institute of Electrical and Electronic Engineers.

Shop drawings and catalog cuts for all electrical and related materials shall be submitted by the Contractor for approval.

The anchor bolts are to be supplied by the Contractor. The anchor bolts will be installed using a template, and set so that luminaire arm is perpendicular to the roadway.

Anchor bolts, nuts, couplings, washers, and cap screws shall be of carbon steel conforming to the requirements of AASHTO M 314, and hot-dip galvanized in accordance with AASHTO M 232/M 232M.

New aluminum lighting standards shall consist of a tapered aluminum shaft having a base welded to the lower end. The pole shaft, pole extensions, and davit arms shall each be spun from one piece of seamless tubing, the strut and arm plates shall be extruded, all of which conform to the requirements of ASTM B221 aluminum alloy 6063-T6. The shaft shall have no circumferential welds, except at the lower end joining the shaft to the base and shall conform to the dimensions listed in the chart below. The shaft shall contain an internal vibration dampening device positioned approximately 2/3 the height of the pole. The top of the lighting standard shaft shall be drilled for two lockbolts to secure the davit bracket to the lighting standard shaft. If the pole is not placed on a transformer base, it will have one 4" x 8" handhole which after

pole is set should face the roadway such that the maintainer can access it from the shoulder.

Bracket arms shall be of the davit type. The davit arm shall be designed to slip over the top of the lighting standard shaft for a distance of at least 12" (300 mm). The luminaire end of the davit arm shall be fitted with a 2" (50 mm) NPS aluminum pipe not less than 6" (150 mm) long. The height of the lighting standards will be determined by the Contractor to provide a nominal mounting height as shown on the Plans. The length of the davit arm will be as shown on the Plans or 12' (3.6 m) if not specified elsewhere. Davit arm less than 10' (3.0 m) long shall not be used without written permission from the Chief Traffic Engineer.

Each lighting standard shall be provided with a permanent tag that shall be 2" x 4" and fabricated from clear, anodized 1/16" thick aluminum. The edge shall be smooth and corners rounded and the tag shall be curved to fit the light standard shaft. Tags shall be secured to shafts by means of four (4) 1/8" diameter 18-8 stainless steel round head drive screws of self-tapping screws. The embossed identifying letters and/or numerals shall be not less than 3/4" high with stroke width of not less than 3/16". Identifying letters and/or numerals shall be as designated on the Plans.

Transformer Base: Transformer bases, when required, shall conform to the 2009 edition of AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaire and Traffic Signals".

Before any work, begins the Contractor shall submit documents showing that the breakaway device meets the current AASHTO Breakaway Design.

For breakaway installations, the standard shall electrically disconnect from the supply wire at the foundation when knocked down by an errant vehicle or from some other cause.

Luminaire: Provide an HPS, roadway luminaire, with photo cell receptacle and shorting cap, multi-voltage ballast, light distribution pattern as specified on the plans, connector kit, and 1.25"-2" slipfitter.

Each luminaire shall include an HPS lamp of the wattage specified on the plans.

The luminaire shall have a die cast aluminum housing with an optical assembly and a removable door. The door shall have integral hinges for hands-free installation, relamping, and maintenance. Hinges shall be made from non-corrodible material.

The luminaire shall have a cutoff optical assembly that includes an aluminum reflector with a heat/impact-resistant tempered sag glass lens or acrylic or polycarbonate resin clear globe. Luminaires with flat lenses shall not be considered acceptable. The refractor door shall be tightly sealed with an appropriate gasket to make a dust-tight optical system. The latch for the refractor door shall be of sufficient size to enable easy handling and constructed of rust resistant materials. The latch shall produce an audible click when it is properly locked.

In order to provide for normal exchange of air between the inside and outside of the optical system, a ventilating channel shall be provided. The channel shall contain a charcoal filter which will prevent the entrance of flying insects and other small animal life forms, as well as provide a cleaning action on the air to remove smoke and dust particles.

The luminaire shall be of the multi-voltage ballast regulator type. The ballast shall be capable of maintaining the wattage of the HPS lamp throughout the life of the lamp. The ballast and the photoelectric control shall be suitable for operating the units of the wattage specified.

All major electrical components, including ballast, shall be mounted on the removable mounting door and connected to the fixture electrically through a quick disconnect plug. The luminaire shall employ

solderless push-on type connectors for all wiring connections to facilitate the replacement of any component.

The luminaire shall be completely wired so that it shall require only the connection of the power supply cables to a terminal block for energizing the entire fixture.

The luminaire shall be equipped with a porcelain, corrosion resistant socket. The socket shall be easily adjustable to provide different light distributions; such adjustments shall be accomplished through adjusting not more than two screws within the optical assembly. The socket in this installation shall be preset to provide a distribution pattern as indicated on the Plans or type III distribution pattern if not indicated.

The luminaire shall have a 2 bolt slipfitter suitable for mounting on a 1.25"–2" mounting arm. A birdguard shall be provided with each luminaire. The luminaire shall be designed with a leveling pad and capable of being adjusted +/- 3 degrees for proper leveling.

The luminaire shall have a NEMA-approved decal attached to the housing, which shall be readily visible from the ground. The decal shall be yellow (to indicate HPS lamp) and shall indicate the lamp wattage.

All electrical materials shall conform to the applicable requirements of the National Electrical Code (NEC) of the National Fire Protection Association.

The luminaire shall be UL Listed.

The Contractor shall furnish and install identification decals on the luminaire housing that can be seen visually from the road. Lamp decals shall indicate the lamp wattage and type via standard identifying numbers and background color. For example, "25" on a yellow sticker indicates a 250 watt high pressure sodium lamp.

No luminaire shall be installed until the lamp socket position has been inspected and approved by the Engineer. All luminaires shall be adjusted up or down on the slipfitter to provide maximum light on the roadway to be lighted. The connections between the luminaire and service cable shall be made with a connector kit using #10 AWG single wire. Installation of the connector kit shall be in accordance with the manufacturer's recommendations.

Installations of Lighting Standards: Lighting Standards shall be installed and located in accordance with the Plans, to provide continuously aligned lighting.

The bracket arms shall be set perpendicular to the edge of the roadway unless otherwise ordered or specified. If necessary aluminum shims may be used to plumb the pole.

#### **Method of Measurement:**

The quantity of aluminum lighting standards with single or double davit arms of the size(s) specified will be measured as the actual number installed and accepted.

#### **Basis of Payment:**

The quantity of aluminum lighting standards with single or double davit arms will be paid for at the Contract unit price per each. Price and payment will constitute full compensation for furnishing all materials including labor, equipment, hardware, anchor bolts, washers, shims and nuts for the foundations, excavation and backfilling, supply and installation of the transformer base or anchor base, supply and installation of poles and davit arm(s), and supply and installation of the luminaires. This price will also include all miscellaneous hardware, connector kits, and wiring from the supply cables to the luminaire(s), labor, tools, equipment, and

incidentals necessary to complete the work.

4/6/11

**746537 - RELOCATING EXISTING LIGHT STANDARDS****Description:**

This work consists of removing, storing, and installing existing light standard(s) at location(s) shown on the Plans and as directed by the Engineer.

**Materials and Construction Methods:**

Any material required and furnished under this item, shall be in accordance with the notes on the Plans.

The light standard shall be carefully removed from the existing location to avoid any damage. Should any damage occur to the light assembly, and in the opinion of the Engineer adequate precaution was not exercised by the Contractor during the relocation operation, the Contractor shall at his/her expense replace damaged component in kind or equivalent to the satisfaction of the Engineer.

The Contractor shall contact the manufacturer of the existing light pole and/or transformer base to determine the appropriate anchor bolt size. This will require supplying the manufacturer with existing pole information, dimensions and design criteria. Anchor bolts shall be hot dipped galvanized and meet the requirements of AAHSTO M 314. Anchor bolts shall have a minimum yield strength of 55,000 PSI. Once the manufacturer has determined the anchor bolt size, detailed drawings and design information shall be supplied to the Engineer for approval prior to installation. Design shall be in accordance with the 2009 edition of AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals".

Final acceptance of the light standard shall be made only after its satisfactory operation as determined by the Engineer.

**Method of Measurement:**

The quantity of light standards relocated will be measured as the actual number of light standards relocated and accepted.

**Basis of Payment:**

The quantity of light standards relocated will be paid at the Contract for unit price per each. Price and payment will constitute full compensation for removing, storing and installing the entire light standard unit, including but not limited to, pole, luminaire, transformer base, furnishing and installing new anchor bolts, installing new fuse if required by the Engineer, labor, tools, equipments, and all incidentals to complete the work.

4/6/11

**746592 - REPLACE/ADAPT EXISTING TRANSFORMER BASES****Description:**

This item shall consist of adapting or replacing the existing light pole transformer bases so that they meeting current standards for breakaway poles.

**Material & Construction Methods:**

The Contractor shall contact the manufacturer of the existing light pole to determine the best method of adapting the transformer bases to be breakaway bases. This will require supplying the manufacturer with existing foundation information and dimensions. Once the manufacturer has determined a method of adapting the bases, detailed drawings and information shall be supplied to the Engineer for approval prior to any installation. It shall show that the breakaway device meets current AASHTO Breakaway Design.

If the existing foundation bolts protrude more than 5 inches above the existing ground, the area around the foundation shall be filled at the direction of the Engineer so that the bolts protrude no more than 5 inches above the finished grade.

All electrical materials shall conform to the requirements of the National Electrical Code of the National Fire Protection Association, and shall conform to all local and special laws and/or ordinances governing such installations. Where these requirements do not govern, and where not otherwise specified, electrical materials shall conform to the Standardization Rules of the Institute of Electrical and Electronic Engineers (IEEE).

Anchor bolts, nuts, couplings, washings, and cap screws shall be of carbon steel conforming to the requirements of AASHTO M 314, and hot-dip galvanized. Anchor bolts shall have a minimum yield strength of 55,000 PSI.

Each transformer base shall be provided with a new foundation as specified on the Plans. The foundation payment will be made under Item 602774. Cost for removal of the existing foundation shall be included under item 746830.

**Method of Measurement:**

The number of light pole transformer bases to be adapted/replaced shall be the number of poles adapted as called for on the Plans for which the work has been completed according to these specifications.

**Basis of Payment:**

The number of light pole bases adapted as measured above, shall be paid for at the contract unit price bid per Each for "Replace/Adapt Existing Light Pole Transformer Base," which price and payment shall be full compensation for all materials, removing and resetting the light pole/replacing the transformer base, rewiring, grading around the foundation base, disposal of surplus materials, furnishing and installing all materials and for all labor, tools and incidentals necessary to complete the work.

4/7/11

**746620 - RELOCATION OF EXISTING LIGHTING TOWER****Description:**

This work item shall consist of relocation of 100' lighting towers being affected by the proposed work under this contract as indicated on the plans, in accordance with the notes, as described in these Special Provisions and as directed by the Engineer.

**Materials:**

See Plan sheets.

**Construction Methods:**

The work under this item shall consist of removing lighting towers complete with tapered shafts, base plate, and associated materials, control enclosure, and secondary wiring; installing them on new concrete foundations with new anchor bolts; making all required connections; and, grounding and bonding all at the locations indicated on the Plans or as directed by the Engineer.

The existing luminaires shall be removed and replaced with new luminaires. This work is included in other items in the contract.

The high mast tower lighting control cabinets shall be relocated near the new high mast tower location and installed on supports equal to the existing installation.

Removal of the complete existing lighting tower as above defined shall be executed in a careful manner, to the satisfaction of the Engineer, to obtain the lighting tower in the best possible condition for reinstallation.

Prior to the removal of the lighting tower and before and after installation of the lighting tower, all welded and bolted connections shall be checked for soundness by a qualified inspection personnel approved by the Engineer. All inspection and testing shall be performed by a firm or agent employing certified inspection personnel and using up-to-date equipment and approved by the Department. All inspection and testing shall be performed in the presence of the Department's representative. The apparent low bidder shall submit to DeDOT, within ten (10) calendar days after the bid opening, the name, address and telephone number of the firm or agent selected to perform visual inspection of the bolted connections and to perform visual inspection and non-destructive testing of the welds.

Any defects discovered during the inspection of bolted and welded connections prior to the removal of the existing tower shall be repaired prior to the relocation of the tower and this work will be paid for at a price to be agreed upon in writing by the Contractor and Engineer before such work begins in accordance with Section 109 of the Delaware Standard Specifications.

Any damage to the lighting tower caused by the Contractor during the removal and reinstallation operation, shall be replaced by equivalent new materials or repaired to the satisfaction of the Engineer at the expense of the Contractor.

All repair work, prior to or after relocation of the tower, shall be performed by a firm or agent employing qualified personnel and using up-to-date equipment and approved by the Department. All repair work shall be completed to the satisfaction of the Engineer.

**Basis of Payment:**

Payment for relocating existing lighting tower (exclusive of foundation) will be made for the actual number of such existing lighting towers removed and reinstalled in place, completed and accepted, at the price each bid for the item 746620 - RELOCATION OF EXISTING LIGHTING TOWER, which price and payment shall constitute full compensation for disconnecting, removing and reinstalling the lighting tower assembly complete with the control enclosure and wiring within the lighting tower shaft; furnishing and installing new anchor bolts, galvanizing, making all required connections; providing new grounding and bonding as needed; all materials, labor, equipment, tools and incidentals necessary to complete the work.

Payment for all labor, materials, equipment and incidentals necessary to inspect all welded and bolted connections as specified above shall be included in the item 746620-Relocation of Existing Lighting Tower.

Payment for all labor, materials, equipment and incidentals necessary to repair any defects discovered during the inspection of bolted and welded connections prior to the removal of the lighting tower shall be paid for at a price to be agreed upon in writing by the Contractor and Engineer before such work begins in accordance with Section 109 of the Delaware Standard Specifications.

No additional payment will be made for any repairs of damage caused by the Contractor during the removal and reinstallation of the existing light tower.

Payment for removal of the existing luminaires shall be made under Item 746816 – Removal of Luminaire. Payment for providing and installing new luminaires shall be made under Item 746563 – Luminaires (HPS), 1000 Watts. Payment for modifying electrical cables and controls for 277/480V operation shall be made under Item 746579 – Electrical Modifications to Existing Towers.

4/7/11

**746621 - LIGHTING TOWERS AND INSTALLATION****Description:**

This item shall consist of furnishing all materials and erection of 120' lighting towers complete with but not necessarily limited to: tapered pipe shaft; base plate; anchor bolts; handhole; luminaire mountings; luminaires; circuit breaker; terminal board; all cables and wires; cable grip; all fastening clamps and hardware; identification tags; grounding; and all necessary connections at locations indicated, in accordance with the notes and details shown on the plans, as described in these Special Provisions and as directed by the Engineer.

**Submittals:**

Complete photometric, assembly, and electrical data shall be provided for each type luminaire proposed. The data shall include candlepower distribution and isofootcandle graphs, assembly drawings with replacement part numbers, and electrical schematic with ballast input, output voltage, amperage, and wattage ratings.

Complete construction details for the structural items shall be submitted to the Delaware Department of Transportation. The details shall be substantiated with design calculations signed and sealed by a professional engineer licensed in the State of Delaware.

All shop drawings shall show clearly the nature, dimensions and location of all welds, bolt sizes, open holes, painting and other details.

**Materials:**

All structural metalwork and the erection thereof for the lighting towers shall conform to the Section 605 of the Standard Specifications except as modified below:

High Mast Lighting Towers shall be designed for mounting a head frame and lowering device assemblies. Design shall be in accordance with the 2009 edition of AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals".

Provide a reinforced access door opening in the base of the pole shaft that secures with a cover. Furnish a cover made with stainless steel hinges that bolts shut with stainless steel hex bolts and is weather tight. Fit the cover with a stainless steel padlock hasp and install a department-approved padlock.

The shaft shall be made from the best grade, hot rolled, basic open hearth steel conforming to the requirements of the Society of Automotive Engineers Specification S.A.E. 1015. It shall be formed, welded and longitudinally cold rolled under sufficient pressure to flatten the weld, form a round tapered tube and improve the physical characteristics of the metal to ensure a guaranteed minimum yield strength of 50,000 psi. The shaft sections shall taper uniformly from top to bottom and shall assemble by telescoping over the next lower section with a firm tapered fit. The telescoping field joints shall not be welded. Assembly of the telescoping sections into one shaft shall be accomplished in accordance with the manufacturer's recommendations.

All sections of pipe shafts necessary for the lighting towers shall be furnished by the Contractor.

Ends of pipe sections shall be furnished with ends cut square.

Slip sleeve splices in pipe shafts will be permitted only where shown on the Plans. All base plate connections shall be made in the shop. Electrodes shall conform to the requirements of A.S.T.M. Specification A233. E-70 Series low-hydrogen electrodes shall be used for all welds involving tower shaft; all other electrodes for the tower metalwork shall be E-60 Series low hydrogen electrodes.

A true end cut shall be provided at the ends of the pipe sections to be welded, in order that the required root opening may be maintained.

All welding, including radiographing, shall conform to the current requirements of the ANSI/AASHTO/AWS

D1-5 Bridge Welding Code. Pipe shaft welds shall be made by the manual shielded metal-arc welding process.

All base plate connections shall be radiographed at the expense of the Contractor.

Steel shapes, plates and bars shall conform to the requirements of A.S.T.M. Specifications A709 Grade 50 unless otherwise noted.

Unfinished bolts and nuts shall conform to the requirements of A.S.T.M. Specification A307.

C. Stainless steel bolts, nuts and washers shall conform to the requirements of A.S.T.M. Specification A153, Class

High-strength bolts, nuts and hardened washers shall conform to the requirements of A.S.T.M. Specification A325 Type I.

Anchor bolts shall be hot dipped galvanized and meet the requirements of AASHTO M 314. Anchor bolts shall have a minimum yield strength of 55,000 PSI.

Gaskets for handholes shall be neoprene rubber conforming to the requirements of A.S.T.M. Specification D752.

All metal parts, except the tower shafts including base plates and stiffener plates, stainless steel and non-ferrous metals, shall be hot-dip galvanized after fabrication in accordance with A.S.T.M. Specification A123.

Metals or hardware on which the galvanizing has been damaged shall be replaced with new materials having properly galvanized surfaces except that subject to the approval of the Engineer, minor damage to galvanized surfaces may be repaired by field galvanizing with the application of a paste composed of approved zinc powder and flux mixed with a minimum amount of water. The places to be coated shall be thoroughly cleaned before the paste is applied. The surface to be coated shall first be heated with a torch to a sufficient temperature so that all metallic in the paste are melted when applied to the heated surface. Extreme care shall be taken to see that the surrounding galvanized surfaces are not damaged by the torch. The flux in the paste will cause a black substance to appear on the surface of the coated parts and this black substance shall be removed by wiping off with waste or by the quick application of cold water. A sufficient number of coats shall be applied to such damaged areas to ensure that a thickness of at least equivalent to two ounces of zinc per square foot has been attained.

All erection work shall be subject to the inspection of the Engineer, or his representative, who shall be given all facilities required for a thorough inspection of the workmanship. Material and workmanship not previously inspected will be inspected after its delivery to the site of the work.

The proper execution of the high-strength bolting operation shall be checked by applying an approved manual torque wrench to a minimum of 5 per cent and a maximum of 10 per cent of the bolts. The torque shall at least equal the equivalent torque for required minimum bolt tension (based on non-lubricated bolts and nuts). If the bolts are not sufficiently tight, additional bolts shall be checked and tightened with a torque wrench, as directed by the Engineer. No loose or imperfect bolts will be allowed to remain in any part of the work.

#### Handholes:

Openings for handholes shall be reinforced to maintain the design strength of the pole. The handhole shall have a weatherproof gasket made of neoprene or silicone rubber. The gasket shall be formed for a forced fit around the handhole or be attached by mechanical means. The door hinges shall be the same type steel as the poles. The hinge pins and other securing hardware shall be stainless steel and tamperproof. The door shall be fabricated to allow for a padlock. The hasp used for padlocking shall be fabricated from stainless steel.

#### Lowering Device:

Each high mount light standard shall have a device to lower the luminaires from the operating position at the top of the standard to a service position approximately 3 ft. above the base of the standard. The device shall include a

head-frame, luminaire ring, and winch assembly. The device shall be designed for the number of luminaires as shown on the plans.

#### Head Frame Assembly:

Attach, to the top of each high mast pole, a head frame assembly designed to support the luminaire ring with its required number of luminaires, in addition to the cable pulleys and mechanisms. Mount pulleys and mechanisms on the head-frame assembly and cover them with a protective, non-corrosive housing. Make necessary cable openings as small as practical to prevent birdlife entry. Provide a housing that can be easily removed from the head-frame assembly for service of pulleys and other mechanisms.

Provide a 24 inch, nickel-tip copper lightning rod on each pole, extending not less than 20 inches above the head-frame cover and located on or near the pole centerline. Ground the lightning rod to a suitable lug at the pole top, using No. 1/0 AWG braided copper, adapters, cable connectors and a grounding lug furnished by the lightning rod manufacturer. Mount the lightning rod with brass or bronze hardware.

Fabricate pulleys of either cast steel with a nylon bushing or aluminum with a bronze bushing, both with a stainless-steel shaft, Type 304, and both equipped with guards to prevent the cable from jumping off the pulley.

Furnish a head frame that provides three-point suspension and positive centering and engagement between the mating parts of the head frame and the luminaire ring assembly. Hot-dip galvanize the head from, after fabrication, per ASTM-A123, or completely zinc-electroplate with an additional 5 mil minimum thickness of approved zinc-rich paint or an epoxy powder coating.

#### Luminaire Ring:

The luminaire ring shall be constructed from steel, hot-dip galvanized after fabrication per ASTM-A123. It shall be pre-wired and include a weatherproof junction box and test receptacle for ground level testing of luminaires. If a special cable is required for ground level testing, one cable shall be supplied with each portable power unit. The ring shall include the appropriate number of 2 inch steel luminaire mounting tenons installed. The luminaire ring shall have spring loaded iris arms or spring loaded rollers to keep the ring concentric around the pole during raising and lowering. Springs and spring mounting hardware shall be stainless steel.

The luminaire ring shall be supported by means of hoist and lifting cables, manufactured from stainless steel aircraft cables of seven strands with 19 wires per strand with a minimum breaking strength of 3,900 lbs. A terminator shall be provided for joining the hoist cable and 3 suspension cables.

#### Latching Mechanism:

Each pole shall be provided with a latching mechanism that shall secure the suspension cables and minimize the stress on the winch cable and winch. The latching mechanism shall be completely accessible through the access door in the pole base. Additionally, a safety chain shall be provided capable of supporting the full weight of the luminaires and lowering equipment in the event of a failure of the latching mechanism.

#### Winch Assembly:

Provide a self-locking, permanently lubricated, worm gear winch assembly, enclosed within the pole mast, capable of raising and lowering the entire luminaire ring when driven by a portable power unit. The winch assembly shall consist of a winch drum and gearbox mounted in the pole and an external power unit. The winch assembly shall include a failsafe brake system to prevent freewheeling of the winch drum. The winch drum shall automatically reverse the lay of the hoist cable and not allow uneven build-up or tangling.

#### Portable External Power Unit:

The portable external power unit shall consist of a heavy duty reversible drill motor, torque limiter, transformer, and remote switch. The torque limiter shall cause drive slipping at a predetermined torque load to prevent damage to the system. The unit shall operate from a remote switch, with sufficient cable length to allow the operator to stand a

minimum of 15 ft. from the base of the pole during lowering and raising operations. Provide sufficient length of cable and mating plug to directly utilize the power supply. Equip the power unit to attach to the winch drive shaft and the pole so that the unit is completely self-supporting.

The power unit shall raise or lower the luminaires at a rate of not less than 10 feet per minute. As part of the power unit, a transformer shall be provided to convert from the operating voltage of the luminaires to 240 volts for the portable power unit. The transformer shall have a 10 foot long, 3/C, 600 volt, heavy duty portable cable with plug to match the drive unit receptacle in the base of the lighting mast and a grounded weatherproof receptacle on the load side to supply the power unit motor. All outlets shall be easily accessible from the access door.

The complete unit shall be supplied in a durable metal storage case with all equipment and instructions for operation. The case shall have a continuous hinge on the lid and sturdy carrying handles. One portable power unit and case shall be provided for the completed project.

#### Electrical Equipment:

Terminal boards shall be rated 30 amperes, 600 volts, fabricated from non-tracking materials and equipped with covers.

Plugs and receptacles shall be heavy duty, weather resistant, rated 20 amperes, 240-volts AC, grounded type. Receptacles shall have weatherproof cap and mating plug.

Electrical power cord shall be Type SO, extra flexible, rated for 600 volts. Power cord shall be 4 conductor #8 AWG. Provide UL listed, watertight cord connectors.

Junction boxes shall be galvanized cast iron with hubs and hinged covers.

#### Luminaires:

The reflector with its aluminum cover shall be firmly attached to a cast ring. This ring shall have keyhole slots in its upper surface such that the reflector/refractor assembly may be readily attached to or detached from the luminaire bracket entry and lamp support assembly without completely removing the support bolts.

Each luminaire shall contain an integral auto-regulator type ballast connected for 277V input +/-10% and a power factor more than 90%. The luminaire ballast shall be enclosed within an aluminum housing which integrally attached to the luminaire bracket entry and lamp support assembly. It shall be readily removable without removing the luminaire from the bracket arm.

The luminaire shall be attached to the bracket arm by means of a bracket entry and lamp support assembly. The assembly shall include a side entry slipfitter designed for a 2 inch pipe with provision for 3 degrees adjustment for leveling the luminaire. An enclosed terminal block shall be included such that all electrical connections shall be protected from exposure to weather.

All electrical connections shall be made waterproof or be made inside a weather resistant enclosure. All luminaires shall have the ANSI/IES light distribution as indicated on the plans. Each luminaire shall be labeled with a permanent label that states the type of lamp, voltage input, power input, power factor, ballast type, socket position, ANSI/IES light distribution and any other catalog information to allow for a replacement to be readily ordered.

#### **Construction Methods:**

The loading, transporting and unloading of all parts shall be conducted to avoid injury and deformation of the metal. Areas damaged in transport or erection shall be repaired to the satisfaction of the Engineer. During the erection process, all materials shall be handled carefully and shall be stored on platform, skids, or other supports to keep parts off of the ground. The steel shall be kept free and clean from all foreign materials, particularly grease, oil, concrete, chock marks and dirt that may effect the natural oxidation of the steel. All structures shall be treated with care given to any product such that the finished surface remains as prepared in the fabrication shop. Any foreign matter that gets on the surface after galvanizing shall be removed as soon as possible and the soiled areas shall be returned to the

conditions as listed above.

The Contractor shall submit erection plans and procedures to the Engineer for approval prior to installation of the High Mast Lighting Structure on location. Structures shall be installed with all internal wiring, attachments, and hoist cable assemblies in place and erected in accordance with the manufacturer's recommendations. Structures shall be erected plumb. Plumb shall be checked using two transits set 90 degrees apart. Plumbing shall not be done in full sun to avoid deflection from radiant heat. Tolerance for plumb shall be 3 inches per 100 feet. Nuts shall be tightened to secure the structure in place.

#### Luminaires:

All high mount luminaire shall be lamped just prior to testing the system. The date of installation shall be marked with the code on the base of each lamp.

Each luminaire shall be leveled and secured in all directions. Careful attention should be given to luminaire aiming. The wiring for each luminaire shall be securely terminated and shall include an equipment grounding conductor to bond the housing to the supply cord grounding conductor.

#### Operation:

The operation of the lowering device shall be demonstrated by the Contractor by raising and lowering the ring with luminaires a minimum of five (5) times for each high mast. The raise and lower demonstration shall include latching and unlatching at the top and connection of test cables at the bottom. Twisting of the cables, failure of the ring to latch or unlatch, unlevelness of the ring, or hang-up of guide arms will be sufficient reason for the Engineer not to accept the lowering device.

#### **Method of Measurement and Basis of Payment:**

Payment for lighting tower installations will be made for the actual number of lighting towers, exclusive of foundations, installed in place, completed and accepted, at the Contract unit price each bid for the item 746621 - Lighting Tower and Installation, which price and payment shall constitute full compensation for furnishing all materials, fabricating and erecting the tower complete with tapered pipe shafts, base plates, luminaire head assembly and lowering mechanism, portable external power equipment, luminaires, all other structural metal work, handholes, anchor bolts, galvanizing; welding, furnishing and installing all required electrical materials and equipment, all fittings, internal wiring, cable grip for vertical riser cables, hardware, identification tags, and lighting luminaire aiming data chart; grounding and bonding; all necessary connections; performing all prescribed structural and electrical tests and furnishing required certificates therefore; all materials, labor, equipment, tools and incidentals necessary to complete the work.

4/6/11

**746716 - ELECTRIC SERVICE ON PEDESTAL**  
**746717 - ELECTRIC SERVICE ON PEDESTAL WITH SERVICE RISER**

**Description:**

This work consists of the installation of an electrical service, aerial or underground, on a pedestal board or on a pedestal board with service riser.

**Materials:**

Meter pan (Supplied by Contractor - utility company approved)  
 3/4" (19 mm) "LB" conduit  
 3/4" (19 mm) and 2" (50 mm) two hole pipe straps  
 3/4" (19 mm) weatherhead  
 2" (50 mm) galvanized conduit (5 feet (1.5 m) ±)  
 3/4" (19 mm) aluminum conduit (20 to 40 feet (6 to 12 m) ±)  
 2" (50 mm) "C" conduit, with cover and gasket  
 2" (50 mm) to 3/4" (19 mm) reducer  
 2" (50 mm) conduit ground clamp  
 3/4" (19 mm) and 2" (50 mm) offset nipples  
 60 amp fuse disconnect with 30 amp fuse  
 #8TW or THWN stranded copper wire (50 to 100 feet (15 to 30 m) ±):  
   - black and/or red for power  
   - white for neutral  
 #4 split bolt connector  
 #8/2 UF with ground  
 #8/3 UF with ground  
 #6 bare copper wire  
 3/4" (19 mm) Ground rod  
 3/4" (19 mm) Ground rod clamp  
 Copper covered staples  
 Service wedge clamp  
 Pressed steel channel clevis  
 Insulator  
 2" x 12" x 8' (50 mm x 300 mm x 2.4 m) pressure treated pine board, or sized as needed for required equipment  
 Anti-oxidant joint compound  
 Line Side Isolating Switch (per Delmarva Power Requirements for 3 phase electrical services)

All electrical materials shall conform to the requirements of the National Electric Code of the National Fire Protection Association, to all local and special laws, and/or to ordinances governing such installation. When these requirements do not govern, and where not otherwise specified, electrical materials shall conform to the Standardization Rules of the Institute of Electrical and Electronic Engineers. Shop drawings and catalog cuts for all electrical and related materials shall be submitted by the Contractor for approval.

**Construction Methods:****Electric Service on Pedestal without Service Riser:**

All work shall comply with NEC and NESC standards and comply with utility company minimum requirements.

All conduits and hardware connections shall be tightened with the appropriate wrenches or tools.

The meter pan shall be wired for 240 V single phase on the line side, unless otherwise noted on the Plans.

All service wires shall be #8 stranded copper.

All connections made within a meter pan shall include an anti-oxidant joint compound.

Install a 2" x 10" x 8' (50 mm x 250 mm x 2.4 m) pressure treated board with 3 feet (0.9 m) of the board placed in the ground at the service location as directed by the Engineer.

Install an appropriate length of 2" (50 mm) galvanized conduit (threaded and reamed on both ends) on the end of the 90-degree sweeps (installed by others or under other items in this contract) at the base of the pedestal board so that the conduit will be 3 feet (0.9 m) above the finished grade of the area.

Install the 2" (50 mm) "C" conduit on the top of the 2" (50 mm) galvanized conduit.

Place the meter pan 4 to 6 inches (100 to 150 mm) above the conduit and install a 2" (50 mm) chase or close nipple between them using approved methods. Place the meter pan on the pedestal to allow room for the line side conduit and connection (installed under other items in this contract) to be made.

Install #8/2 UF cable from the meter pan to the signal cabinet or the load location. The #8/2 UF cable and its installation shall be paid separately under other items in this contract.

The white wire shall be connected to the white wire of the #8/2 UF cable by the use of split bolt connector. The insulation should be removed from the ends of the wire to expose only 3/4" (19 mm) of stranded wire. The connection shall be completely taped. The bare copper wire from the #8/2 UF shall be attached to the "LB" conduit with a ground screw or clamp. The bare copper wire shall not enter the meter pan.

The black wire shall have a fused disconnect installed as per the manufacturer's installation instructions. Place all wires inside the conduit and install the cover(s) with gasket(s).

Install the ground rod under the conduit, driving rod within 6" (150 mm) of final grade. Using the appropriate ground rod clamps, attach enough #6 bare copper to reach and be connected to the 2" (50 mm) conduit ground clamp, to within 6" (150 mm) of the ground rod. Staple the #6 ground wire to the pedestal leaving enough slack to drive ground rod flush with final grade. Staples shall be placed every 6" (150 mm) and the #6 bare copper will be placed in a neat manner.

#### Electric Service on Pedestal with Service Riser:

Install the pedestal as described above. The pedestal will be installed within 10 feet (3 m) of the utility company's wood pole. If the distance from the pedestal to the utility company's wood pole exceeds 10 feet (3 m), the additional work and material will be covered under other items of this contract. Install a length of 2" (50 mm) galvanized conduit under the meter pan, so that the conduit will have 2 feet (0.6 m) of cover after a 2" (50 mm) galvanized elbow is installed. Connect the required length of 2" (50 mm) conduit to the elbow and install a second 2" (50 mm) galvanized elbow so that it is in direct contact with the utility company's wood pole. Install a 2" x 3' (50 mm x 0.9 m) nipple to the elbow. Reduce the 2" (50 mm) conduit to 3/4" (19 mm) with an approved reducing bushing. Install 30 feet (9 m) of 3/4" (19 mm) aluminum conduit above the conduit reducer, securing it to the wood pole within 12" (300 mm) of the conduit reducer and then at intervals not exceeding 3 feet (0.9 m). On the top of the 3/4" (19 mm) aluminum conduit install a 3/4" (19 mm) weatherhead, and secure the conduit to the wood pole within 12" (300 mm) of the weatherhead.

Install 3 (three) # 8 THHN stranded conductors {1 red, 1 black and 1 white} from the line side of the meter pan to the weatherhead, leaving 5 feet (1.5 m) coiled and taped outside for connection by others. Connect the other end inside the meter pan using an anti-oxidation.

For three phase services, install line side isolating switch (disconnecting means) with a visible break on the metered service pedestal next to the meter. Equipment and installation shall meet Delmarva Power requirements. Proper number and size of cables and conduit shall be provided for three phase service installations.

#### **Method of Measurement:**

The quantity of electrical services will be measured as the number of services installed in accordance with these specifications, complete in place, and accepted.

**Basis of Payment:**

The quantity of electrical services will be paid for at the Contract unit price per each. Price and payment shall include full compensation for installing the service, all utility permits, all materials and for all labor, tools, equipment, and incidentals necessary to complete the item.

4/29/11

**759501 - FIELD OFFICE, SPECIAL****Description:**

This Field Office, Special item is a field office complex the work of which consists of erecting, furnishing, equipping, maintaining, and removing two (2) double wide modular field office units, their entrances, and its adjacent parking areas. These field office units may be situated in different locations. The Contractor shall submit a specific location layout drawing and construction details for each field office, its entrance, and its parking area for approval by the Engineer. Each field office and its parking area shall be for the exclusive use of Department Officials, Engineers, Consultants, and Inspectors.

Each field office structure shall be free of asbestos and/or other hazardous materials. Each field office, its entrance, and its parking area shall be constructed and installed in accordance with all applicable city, county, state, and federal codes. The Contractor shall be responsible for obtaining all required licenses and permits for installation and placement of each field office, its entrance, and its parking area. The costs of obtaining such licenses and permits are to be incidental to the "Field Office, Special" Item. Each field office shall be available for use by the Department continuously throughout the duration of the project.

**Construction of and Equipment for the Field Offices:**

Each field office shall be new and have a minimum floor space of 1,200 square feet with minimum exterior dimensions of 50'-0" length by 24'-0". The floor to ceiling height of each field office shall be nominal 8'-0". The exterior walls, ceiling, and floor of each field office shall be insulated. Each field office shall be of weather-proof construction, tightly floored and roofed, constructed with an air space above the ceiling for ventilation, supported above the ground, safely secured to its support if the support is an inground anchored foundation or otherwise by tie-downs to the ground, and fully skirted with rigid watertight covering overlapping the bottom of the exterior siding to the existing ground.

The Contractor shall provide entries to each field office by constructing a stair and deck platform with canopy at each exterior door. These entries shall be fabricated using treated dimension lumber, be constructed with hand and safety railing, be designed to last the life of the Contract, and conform to the requirements of the Architectural Accessibility Board and other federal, state and local boards, bodies and/or courts having jurisdiction in the Contract limits.

The Contractor shall construct and maintain an all weather parking area adjacent to each field office of at least 6000 square feet and having a minimum of 12 functional parking spaces striped for full size cars. An entrance shall be constructed to each field office from its point of access to its parking area as determined by its approved location layout drawing and construction details, the cost to be incidental to the "Field Office, Special II" Item. All weather pathways from the parking area to the entrances of each field office shall also be constructed and maintained. This parking area and entrance pathways shall have a minimum of 2" type "C" hot mix on top of minimum 6" graded aggregate subbase. Snow and/or ice shall be removed from the entrance, the parking area, and the entrance pathways of each field office within 12 hours after each occurrence. Costs for furnishing, placing, and maintaining the aggregate base and hot mix, and for snow and/or ice removal, to be incidental to the "Field Office, Special" Item.

The ground area 30'-0" from around the perimeter of each field office shall be landscaped and maintained. If the earthen grounds do not have a stand of weed free grass, the surface of this area shall be loosened to a depth of 4" and a satisfactory seedbed shall be prepared free of debris and extraneous matter. The area shall be seeded to a healthy stand of grass or sodded, after which the area shall be watered, mowed, and trimmed a minimum of three times a month during the growing seasons. Cost for this landscaping and maintenance is incidental to the "Field Office, Special" Item.

Each field office shall have full carpeting, kitchenette facilities, and interior and exterior paneling, lighting, and plumbing fixtures. Each field office shall have a minimum of two (2) exterior doors, each door having a passage and a deadbolt lock. These door locks shall be keyed and at least 2 complete sets of keys shall be supplied to the Engineer's representatives. The exterior doors of each field office shall be insulated or have storm doors. Each field office shall have a minimum of six (6) windows, each window having a minimum glass area of 1,150 square inches and a horizontal mini-blind covering the full glass area. The windows of each field office shall be insulated or have storm windows, shall be equipped with a locking device, and shall have screens installed and repaired when damaged.

At least two (2) outside water service connections shall be provided at each field office. Each water connection shall have a 3/4" frost proof hose bib with vacuum breaker and shall include 100 linear feet of 5/8" minimum diameter reinforced, industrial or commercial grade, soft rubber hose per connection.

Each field office shall be provided with sufficient natural and artificial light and shall be adequately heated and cooled to provide comfortable working conditions.

Each field office shall have satisfactory lighting, electrical outlets, heating equipment, and exhaust fan and air-conditioning connected to an operational power source. Plan and drawing areas shall have individual fluorescent lights situated over their worktables. Replacement fluorescent lights shall be furnished as required. Electrical current, water, and any fuel for heating equipment shall be furnished and the cost of such shall be borne by the Contractor. Maintenance of the heating, exhaust fan, and air-conditioning equipment for each field office shall be provided for by validated service contracts for the length of the Contract. These service contracts shall allow a Department authorized project person to deal directly with the service organization to request repair.

The Contractor shall furnish and maintain two fire extinguishers and provide one lighted "Exit" sign for each exterior passage door of the field offices. Fire extinguisher(s) may be chemical or dry power and shall be UL Classification 10-B:C(min.) and shall be suitable for Types A:B:C fires. A commercial or industrial type first aid and safety kit suitable for project conditions and hazards (including snakebite) shall be provided and maintained to full capacity on a monthly basis in each field office.

The Contractor shall provide an alarm system in each field office for security with electronic, direct connection to a security service provider. The security systems shall have interior motion, window, and entrance detectors and built in manual fire alarms. All windows of each field office shall be covered with steel bar grids as a deterrent to forced entry. The Contractor shall provide validated monitoring and service contracts for the length of the Contract for each field office. These contracts shall allow a Department authorized project person to deal directly with the security service provider to request service and/or repair.

The Contractor shall furnish and maintain in each field office an adequate supply of cold potable water, a minimum 23 cubic foot new refrigerator, and a minimum 900-watt new microwave oven. Maintenance of the potable water supply equipment, refrigerator, and microwave shall be provided for by validated service contracts for the length of the Contract. These service contracts shall allow a Department authorized project person to deal directly with the service organization to request repair.

Suitable indoor toilet facilities, conforming to the requirements of the State and Local Boards of Health or of other bodies or courts having jurisdiction in the area, shall be provided for each field office. When separate facilities for men and women are not available or required, a sign with the wording "Rest Room" {letter heights of 1" minimum} shall be placed over the doorway and an adequate positive locking system shall be provided on the inside of the doorway to insure privacy. The facility(s) shall be maintained by the Contractor to be clean and in good working condition and shall be stocked by the Contractor with adequate lavatory and sanitary supplies at all times during the period of the Contract.

For each field office the Contractor shall be responsible for performing or for making arrangements for all necessary telephone connections and/or for their maintenance; for providing a new telephone equipment system, for payment of all connections and the new telephone system equipment and its installation; and for final disconnection of the telephones.

The telephone system for the field office complex shall have a total of 9 lines consisting of 8 direct single lines with call forward busy feature and 1 dedicated facsimile line and have 8 key sets consisting of 1 master key set having privacy feature, and 12 six-button key sets having privacy feature (1 set which may be for wall mounting) and 1 TLS or T1 circuit line for data transmission, all for the official and exclusive use of the Engineer and other representatives of the Department. Location of telephone lines shall be as directed by the Engineer. Arrangement shall be made to allow a Department authorized project person to deal directly with the telephone company to report outages and/or request repair. The Contractor shall arrange for the installation and initial setup of the specified telephone system including phone company provision of a termination point with smart-jack. Initial installation and setup costs shall be the responsibility of the Contractor as well. All subsequent monthly billings, after initial installation and setup, for the field office telephone system and the TLS or T1 circuit line shall be received and paid by the Contractor. A copy of each of these subsequent bills shall be forwarded to the Project Resident for reimbursement on the contract pay estimate and the reimbursement will be for the amount of the bill only and shall not include any additional mark-up or profit.

For all other utilities, the Contractor shall be responsible for performing or for making arrangements for all necessary utility connections and/or for their maintenance; for payment of all utility connections, installations, service fees and bills; and for final disconnection of utilities.

The field office interiors shall be furnished by the Contractor. The Contractor shall provide new and maintain the following office furnishings, all which are to be approved by the Engineer prior to installation in the field office

complex. Placement of these furnishings shall be as directed by the Engineer. These furnishings consist of 4 drafting tables with sufficient drawers for standard size plans, either attached to the tables or in cabinet form, each drafting table to have an ergonomic design spring back stool with five leg base having wheel casters, 12 full size office desks each with filing drawer and fully adjustable ergonomic design swivel chair with armrests and five leg base having wheel casters, 2 computer stations with acoustical panels having minimum 60 NRC rating for privacy screen and fully adjustable ergonomic design swivel chair with armrests and five leg base having wheel casters, 1 large conference table for a minimum of 12 people with surrounding chairs with armrests, 4 folding tables minimum 6'-0" by 3'-0" each with ergonomic design straight back chair with armrests, 2 work tables, 2 supply cabinets, 1 or more clothes closets of ample size to meet inspection manpower requirements, 4 rough plan racks, 4 legal size filing cabinets with 4 drawers, 2 legal size fire-resistant filing cabinets with lock and key with 4 drawers and meeting fire underwriters' approval for not less than one hour test, 2 stackable steel flat file cabinets for 43" by 32" size plan sheets each cabinet having 5 drawers with full suspension, rear hood, and hinged front depressor, 2 book shelves minimum 3'-6" by 4'-6" each, 3 vertical surface legal size three compartment pockets, 2 dry erase boards minimum 4' by 3' each with markers and erasers, and 2 cork bulletin boards minimum 3' by 2'. These office furnishings will remain the property of the Contractor at the conclusion of the project.

The Contractor shall also furnish new and maintain the following office equipment for the field office complex, all which are to be approved by the Engineer prior to installation. Location of the office equipment shall be as directed by the Engineer. The required equipment will enable the Department to synchronize project record keeping and office functions. The equipment shall be delivered in working and useable condition:

8 heavy-duty calculators having extra large 12-digit fluorescent display, full size keyboard with contoured keys, two-color ribbon printer, and AC powered;

1 Printer, multifunction having print, scan, copy, and e-media interface capability having print resolution up to 2400x1200 optimized dpi from 1200x1200 input dpi and optimization from photo paper selected, margins roll 0.2x0.2x0.2x0.2 in, ink cartridges cyan, gray, magenta, matte black, photo black and yellow, minimum line width 0.02 mm (GL/2 addressable and guaranteed line width 0.06 mm (ISO/IEC 13660:2001; Scan resolution up to 600 dpi, maximum scam size 36x93.6 in and maximum scan thickness 0.03 in; Copy reduction/enlargement 25 to 400%, copier setting - quality, color, roll, content type, original paper type, background removal, contrast and de-skew; Media handling - printer: sheet feed, 2 automatic roll feeds, automatic roll-switching and automatic cutter - scanner: straight-through scan paper path for sheet and cardboard originals, media types - printer bond and coated paper, technical paper, film, photographic paper, backlit and self adhesive - scanner: non-abrasive paper, vellum, translucent, Mylar, recycled, blueprints and cardboard; Memory, 32GB (virtual) and 160GB hard disk; and Connectivity - interfaces (standard): Gigabit Ethernet (1000Base-T), Hi-Speed USB 2.0 certified, EIO Jetdirect accessory slot - printing languages (standard) ... eMFP: TIFF, JPEG, HP-GL/2, HP-RTL, CALS G4 and HP PCL 3 GUI ... PostScript eMFP: Adobe PostScript 3, Adobe PDF 1.7, TIFF, JPEG, HP-GL/2 HP-RTL, CALS G4, and HP PCL 3 GUI, including drivers supporting the printing languages;

1 Muratec MFX-2855D or Toshiba e-STUDIO 2330c or approved equal all-in-one copier which includes scanner, printer, and fax. Copier to have high speed wireless and network capability. Copier shall have all necessary software and cables for proper operation and shall be connected to high speed wireless and connected for use to share on a local network. Copier to have zoom and preset reduction and enlargement features, automatic two (2) sided copying, automatic document feeder with minimum 30 sheet capacity with automatic stapling capacity;

1 compact plain paper copying machine and cabinet with stationary platen, bypass feeding, and dual loading cassette system with cassettes for letter, legal, and ledger size paper. Copy machine to have zoom and preset reduction and enlargement features, automatic two (2) sided copying, automatic document feeder with minimum 30 sheet capacity, and 20 bin collator with automatic stapling capacity;

1 micro cassette recorder, having fast playback, voice-activated system, three-digit tape counter, silent auto-stop and pause, two tape speeds, one-touch and follow-up, built-in condenser microphone, cue and review, and rechargeable with combination battery charger/AC adapter;

1 telephone answering machine having all-digital recording, 14 minute message capacity, selectable message time, voice prompt assistance, day/time stamp, call screening, two-digit LED message indicator, toll saver, power failure memory back-up, and message interrupt from any station;

12 compact digital cameras with 10 megapixels or greater, maximum dimensions of 3" x 5" x 3, built in flash, autofocus, video mode LCD for review of images, LCD viewfinder acceptable, removable memory compatible

with compact flash, or secure digital (SD) or secure digital high capacity (SDHC), ISO compatible with 100, 200, 400 standard of quality of better, and memory cards supported by camera of 8 GB or better;

1 Canon Vixia HF M300, Panasonic HDC SD60, Samsung HMX-R10 or approved equal digital video camera, 1080p, CMOS optical sensor, digital format H.264, digital photo mode, camcorder sensor resolution 3.2 mega-pixels or greater, SD memory expansion card for still images, connection type, HDMI, USB, component video/audio output;

1 video projector, DLP projector, resolution of 1280x720 or greater, 16.7 million colors, contrast ratios of minimum 2000:1 or greater, video inputs to include SUGA, HDMI, S-Video and RGB, component, video modes minimum 720p or greater;

1 heavy duty 3-hole punch with minimum 40 sheet capacity;

1 extra heavy duty stapler with anti-jam feature having capacity up to 200 sheets; and

1 comb binding machine with manual punching capacity of 10 sheets having a minimum binding capacity of 150 sheets.

Consumables as required to manage the business of the project for each field office shall be provided for all office equipment for the length of the Contract. These consumables shall be furnished on request and shall include but not be limited to paper, tapes, ribbons, various size plastic combs, rolls, toner, cleaning kits, microcassette tapes and batteries, answering machine cassettes, camera batteries and memory cards/sticks, DVD and CD R/RW media, printer plan size paper rolls and ink cartridges, etc.

Maintenance of all office equipment in each field office shall be provided for by a validated service contract for the length of the Contract. This service contract shall allow a Department authorized project person to deal directly with the service organization to request repair.

### **Computer Requirements for Each Field Office:**

Each field office shall have three (3) IBM compatible Microcomputer Systems to be furnished and maintained by the Contractor for use by the Engineer, the cost to be incidental to the "Field Office, Special" Item. The specified computer systems will synchronize the construction management functions of the Department to monitor, report, and perform the accounting of the project work. The computer systems and all their related equipment specified below shall be furnished new and remain the property of the Contractor at the conclusion of the Contract. A detailed listing of the proposed computer systems and all their related equipment to be provided by the Contractor shall be submitted for approval by the Engineer prior to furnishing the Microcomputer Systems. The Microcomputer Systems shall be Laptop Computer Systems each with docking station, unless otherwise determined by the Engineer. In each field office both of the three (3) Microcomputer Systems shall consist of:

#### **Central Processing Unit (CPU) – Lap Top**

Intel I5, version2, processor and wireless networking capability included,

Minimum 4.0 GB RAM with expansion capability to at least 8.0 GB and clock/calendar card equivalent, and

Microsoft "Windows® 7 Professional with 64 bit support or Microsoft Windows® license downgrade to "Windows® XP Professional" operating system;

#### **Memory (Storage)**

CD/DVD +/- RW with double layer write capability, and 120GB hard drive minimum, integrated Ethernet 10/100. Included software shall support double layer media writing and automatic backup of data;

#### **Monitor (LCD)**

Monitor for docking station and docking station. 21" minimum diagonal visual area flat panel capable of multiple frequency color graphics, 1440 x 900 (wide) or 1280 x 1024 or better resolution, 16.7 million display colors, 5 ms response time, D-Sub and DVI video input ports;

Laptop - shall have 15.4" display minimum;

#### Color Graphics Card

PCIe video card or integrated video;

#### Keyboard

Keyboard shall be ergonomic, enhanced layout minimum with keyboard interface cable;

#### Printers

Laser printer, color, capable of printing 8-1/2"x 11", 11"x17" and envelope, having wireless and hard line network connectivity, printers shall have all necessary software and cables for proper operation and shall be connected to high speed wireless and connected for use to share on a local network;

#### Software

The latest version programs for application management (operating system), word processing, spreadsheet, and anti-virus shall be provided with all user manuals. Upgrades, maintenance, and full technical support by the manufacturer shall be provided for the length of the Contract. The required software will enable the Department to synchronize accounting and record keeping functions between the project, District, and Department offices. A list of programs to be provided shall be submitted to the Engineer for approval. Software, other than for application management and anti-virus, is to be delivered unopened to the Department's administrative office. All software is to be compatible with and for use to run on "Windows® 7 Professional" or "Windows XP Professional". The required applications software follows and is to be latest version unless noted:

collection - "Office 2010 Business Professional" with Word, Excel,

antivirus - "Norton™,

replication - Adobe Acrobat X Suite Software w/Adobe Photoshop® CS5 suite, and

software supporting creation of DVD +/- R/RW disks (supporting double layer media writing) and DVDR and DVDRW disks using DVDRW drive, for example: Ahead Nero, Roxio DVD/CD Creator, or some equivalent product. Note: software commonly included as part of the standard CDRW upgrade/standalone package is acceptable if included with the unit;

#### Related Equipment

Wireless networking hub/router, 802.11g or better, with all associated hardware (adapters, cables, etc) and software to enable wireless networking for resource/equipment sharing among all office computers and printers, the cost of wireless and network connections and service to be incidental to the "Field Office, Special " Item,

An electrical outlet with dedicated circuit for the main computer unit,

A wireless optical mouse with proper driving software having complete Microsoft emulation,

Necessary cables for proper operation,

An uninterruptible power supply (UPS) units for protection from power loss or fluctuation, minimum of 6 outlets, adequate to provide a minimum of 30 minutes backup power for an orderly shut down of the computer system with software and connections for automatic system shutdown,

24 bit Sound Blaster compatible PCI soundcard with quality desktop speakers,

A combination surge, spike, and noise protection device with receptacles for all peripherals (may be in combination with the UPS power supply),

A wrist rest suitable for use with the furnished keyboard,

All cards, hardware, and operating, anti-virus, and equipment software to be fully installed and operational;

**Maintenance and Service**

Maintenance of all specified equipment and components shall be provided for by a validated service agreement for the length of the Contract. Maintenance (upgrades, replacement, full technical support) for each software application shall be provided for by validated maintenance agreement for the length of the Contract. These agreements shall allow an authorized project person to deal directly with the service organization to request repair or the maintenance organization to request assistance; and

**Supplies**

Consumables as required to manage the business of the project shall be provided for the Microcomputer Systems in each field office for the length of the Contract. These consumables shall be furnished on request and include but not be limited to memory cards/sticks compatible with provided digital cameras having 8 GB or greater capacity and compatible with provided computers, DVDR and DVDRW media compatible supporting operational minimum to maximum speed of the DVD/RW drive unit, cut sheet paper and labels compatible with the printers, hardware and screen cleaners, printer ink cartridges, and toner cartridges.

**Maintenance Requirements for Each Field Office:**

Maintenance of each field office including its entrance and adjacent parking area, for the time required, shall consist of maintenance and/or replacement of all provided items, security system, furniture and equipment, computer systems, providing lavatory supplies, providing trash containers and waste baskets, providing entrance mats at each door, providing replacement items for lighting fixtures, maintaining all utilities, providing vermin and pest control by professional exterminator(s), providing satisfactory and sanitary janitorial and waste disposal services twice a week, providing cleanup of trash and debris on the parking lot and landscaped area once a week, and shall be included in the monthly unit cost.

The Contractor shall provide and deliver for each field office a current copy of all validated field office equipment and computer maintenance, service, assistance and/or monitoring agreements and/or contracts as mentioned hereinabove to the Department's administrative office on or before the first day each field office is ready for use.

**Method of Measurement:**

This item will not be measured but will be paid for on a monthly basis. Partial months will be paid at the rate of 0.033 months per day.

**Basis of Payment:**

The field office complex will be paid for on a unit price bid per month, which price shall be full compensation for performing the work specified and the furnishing of all materials, labor, tools, equipment and incidentals necessary to maintain each field office, their entrance, and their adjacent parking area and restore each field office area, entrance, and adjacent parking area to match their original site condition. No separate payment will be made for costs involved for removing hazardous material or underground tanks to install these field offices, their entrances, and their parking areas. One (1) unit of payment will constitute erecting, furnishing, equipping, maintaining, and removing two (2) double wide field offices and their entrances and parking areas.

Payment will be made only for the actual number of months that the field office complex is acceptably provided by the Contractor.

The field offices, their entrances, and their parking areas shall be ready for use not later than forty-five (45) calendar days after the date of the fully executed Contract or before construction operations begin.

4/12/11

**763564 - SPECIAL BIDDING PROCEDURE**

**SPECIAL BIDDING PROCEDURE**

The Department of Transportation is using a special bidding procedure for this project for selecting the bidder to perform work.

The process for bidding will take into account not only the price offerings of the bidder but also the speed with which the Contractor can provide a usable facility to the traveling public.

1. Preparation of Proposal Form

The bidder shall establish the number of calendar days that he will require to complete the work, in accordance with the Plans and Specifications, necessary to have the project completed in its ultimate condition with all lanes and shoulders fully open to unrestricted highway traffic. This calendar day number shall be entered on the Proposal Form where indicated. The product of this number of calendar days times the average Road User Cost of \$35,000.00 per day shall be included in the Contractor's total bid price for this proposal. The Total sum will be the amount used as a basis of comparison of bids in establishing the successful bidder.

Consideration of Bids

The total submitted bid shall consist of the following.

Part A = The total dollar amount for all work to be performed.

Total number of calendar days (includes Weather Days as calculated from Table I). The maximum number of calendar days that can be utilized in the calculation of this part of the bid is 1153.

Part B = Proposed Calendar Days x \$35,000/Calendar Day

The total submitted bid will be the sum of Part A and Part B subject to all other governing requirements of the Standard Specifications or Special Provisions.

The successful bid will be determined by the Department as the lowest total submitted bid of all responsive/responsible bidders after bid review. The determination of a responsible/responsive bidder includes a rigorous review of the bid proposal. The lowest responsible/responsive bidder must be prepared to demonstrate that the calendar day portion of the bid is reasonable, rational, and achievable without incurring Liquidated Damages.

The preceding formula shall only be used as a basis of comparison to determine the successful bidder and shall not be used to determine the award amount nor final payment to the Contractor when the project is completed. Only the unit prices bid and the quantities required to complete the project shall be used to determine final payment to the Contractor.

In developing the contract completion time, the adverse weather anticipated for each month is shown in the following table.

Table I: Monthly anticipated adverse weather delay based on a seven (7) calendar day week:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
12	10	5	5	4	2	4	3	4	3	2	6

2. Proposal Guaranty

The proposal guaranty shall be based on 10% of the Contractor's total bid price as resulting from the summation of the unit bid prices on the Bid Proposal Forms. (Price of work proposed, Item A in Formula.)

11/29/10

**ADDENDUM NO. 4**

**UTILITY STATEMENT**

**STATE CONTRACT NO. T200809003**

**PROJECT ID NO. 04-00180**

**SR1 / I-95 Interchange**

**New Castle County**

The following Companies maintain facilities or propose new facilities within the contract limits:

**Delmarva Power (Gas)**  
**Delmarva Power (Electric Distribution)**  
**Verizon-DE, Inc.**  
**Comcast Cable of New Castle County**  
**United Water Delaware**  
**Artesian Water Company, Inc.**  
**New Castle County Office of Special Services (Sanitary Sewer)**

The following is a breakdown of the utilities involved, adjustments and/or relocations as required (all stations, offsets, lengths and calendar days are approximate):

**Delmarva Power (Gas)**

- A. The Company maintains a 12" Ductile Iron Casing Pipe without a carrier pipe within the limits of Contract No. T200809003.
- B. The proposed changes to the Company's existing facilities include, but are not limited to the following:

**1. State's Contractor Responsibility:**

The State's contractor will provide the following: a level area accessible to the Company's construction vehicles, survey for the Company as required, an area accessible for maintenance during and post construction. As well as select, clearing and grubbing, cuts and fills to within 3 inches (+,-).

**2. The Company's Responsibility:**

The Company proposes to extend the existing 12" Ductile Iron casing pipe at Sta. 741+50, Ramp U baseline, approximately 70' eastward.

The Company will require 25 calendar days to complete the proposed construction listed above.

**Verizon-DE, Inc.**  
**Comcast Cable of New Castle County**  
**United Water Delaware**

### **Contract No. T200809003**

- A. The aforementioned Companies maintain aerial, underground and/or buried facilities within the limits of Contract T200809003 with no apparent conflicts with the proposed construction activities.
- B. Any relocations/adjustments to the aforementioned Companies' existing facilities that may arise during construction will be performed by the appropriate Company's forces during construction of this project. The time to complete any relocations/adjustments will depend on the nature of the work.

#### **Artesian Water Company, Inc.**

- A. The Company maintains underground facilities within the limits of Contract T200809003.
- B. The Company will perform the following relocations during the State contract to eliminate conflicts with the proposed roadway construction.
  - 1. Ramp A, Sta. 1268+50 to Sta. 1268+85, offset 150' left. The Company will relocate the existing 12-in DIP with approximately 100 feet of new 12-in DIP in 20-in STL casing to avoid conflict with the proposed roadway excavation. The Company will require fourteen (14) calendar days to complete the proposed work following twenty-eight (28) calendar days advance notice and completion of the Utility Pre-Construction Meeting for this contract. The State's Contractor shall furnish 50 cubic yards of Borrow Type C for this relocation.
  - 2. Ramp E, Sta. 516+40 to Sta. 517+40, offset 80' right. The company will relocate the existing 16-in DIP with approximately 110 feet of new 16-in DIP to avoid conflict with proposed access ramp. The company will require fourteen (14) calendar days to complete the proposed work following twenty-eight (28) calendar days advance notice and completion of the Utility Pre-Construction Meeting for this contract. The State's Contractor shall furnish 10 cubic yards of Borrow Type C for this relocation.
  - 3. Ramp C, Sta. 1101+60. The Company will install approximately 750 feet of 20-in HDPE carrier pipe in 30-in HDPE casing pipe under existing I-95 by directional drill method to establish a critical second feed to the mall region. The Company will require forty-two (42) calendar days to complete the proposed work following twenty-eight (28) calendar days advance notice and completion of the Utility Pre-Construction Meeting for this contract.

The Company will abandon in place the existing water facilities after the relocated water facilities are installed and activated with services tied over. The Company estimates that the identified relocation activities will take place during Contract No. T200809003 and within the State Contractor's construction phasing and maintenance of traffic plan. In addition, system demands and effected customers may require the Company to perform relocation activities during overnight hours.

#### **Delmarva Power (Electric Distribution)**

- A. The Company maintains aerial, underground and/or buried facilities within the limits of Contract T200809003.
- B. The proposed changes to the Company's existing facilities include, but are not limited to the following:

**NOTE: AT ALL SWITCHGEAR AND TRANSFORMER LOCATIONS, DELMARVA WILL REQUIRE A 12 FOOT CLEARANCE ON THE FRONT SIDE OF THE DEVICE**

**Contract No. T200809003**

**AND A MINIMUM OF 4 FEET ON THE OTHER SIDES WITH NO OBSTRUCTIONS SUCH AS FENCE, WALL, SHRUBS AND ANY OTHER STRUCTURES.**

*Outages on the 12kv and 34kv circuits will only be permitted as load, weather and other system conditions permit.*

**1. State's Contractor Responsibility**

The State's Contractor will provide the following: a level area accessible to the Company's construction vehicles, survey for the Company as required, an area accessible for maintenance during and post construction. As well as select, clearing and grubbing, cuts and fills to within 3 inches (+,-).

**2. The Company's Responsibility**

The Company proposes to relocate the existing two (2) 34kv circuits and one (1) 12kv circuit in a 6 way (6 inch ducts) manhole/ conduit system along Ramp C beginning at approximately Sta. 1104+50, Ramp C baseline to Sta. 1108+00, Ramp C baseline, then continuing along and under the SW Loop ramp from Sta. 1908+50, SW Loop baseline to Sta. 1904+50, SW Loop baseline, then crossing under SW Loop ramp and Ramp C to a proposed manhole, then continuing under Ramp C1 near Sta. 1813+75, then paralleling Ramp G1 from Sta. 1316+50, Ramp G1 baseline to a manhole near Sta. 1317+00. From the manhole near Sta. 1317+00, Ramp G1 baseline, the two 34kv circuits in a 4 way (8 inch ducts) will be bored under SR 1 to a proposed manhole within the Mall parking lot and tie into an 4 way (5 inch ducts) existing ductbank.

The existing 12kv circuit will continue from the proposed manhole near Sta. 1317+00, Ramp G1 baseline to a proposed PMH-9 switchgear, then continue to the south and stub up the proposed terminal pole with guy anchors near Sta. 1320+50, Ramp G1 baseline. The Company will install two additional proposed poles along Stanton Christiana Road and connect to the existing 3 phase 12kv service pole near Sta. 2014+00, Stanton Christiana Road baseline. The 12 kv will also connect to the existing pole near Sta. 2016+50 and the Company will install a pushpole brace on the existing pole.

**LIGHTING - Ramp G1 Location** - The Company will furnish and install a transformer, fed from the proposed PMH-9 switchgear, near the proposed DelDOT lighting cabinet and DelDOT service pedestal adjacent to Ramp G1. This switchgear and transformer will provide three-phase 277/480V service for the lighting cabinet along Ramp G1. DelDOT will furnish and install conduit and cables from the service pedestal to the proposed transformer. The Company will assist DelDOT in making the final connections at the transformer. The Company will furnish and install all conduit and cables from the transformer to the switchgear.

**LIGHTING - Churchmans Road Location** - The Company will furnish and install a base mounted transformer near the proposed DelDOT lighting cabinet and DelDOT service pedestal, which will be located at the Churchmans Road interchange in the quadrant south of Churchmans road and north of I-95. The transformer will provide three-phase 277/480V service for the lighting cabinet along Churchmans Road. DelDOT will furnish and install conduit and cables from the service pedestal to the proposed transformer. The Company will assist DelDOT in making the final connections from at the transformer. The Company will furnish and install all conduit and cables from the transformer to the existing utility pole.

**Scheduling of outage and tie over for Existing Circuits:**

## Contract No. T200809003

Overtime will be required in order to splice, terminate and tie in new circuits into the Company's existing electrical system. This will include nights and weekend work. No outages will be permitted during the months of July and August. Outages may be restricted in September in the event of hot weather.

### **Company Review of Field Changes**

The Company maintains the right to review/ approve any design changes submitted by the Engineer as well as the right to review any field changes that could impact the construction of the Company's facilities.

### **Lead-Time for Cable and Associated Materials (16-23 Weeks)**

The lead time to procure these materials could possibly increase due to the economic situation and suppliers eliminating shifts.

### **NOTE: ESTIMATE DOES NOT INCLUDE COSTS FOR THE FOLLOWING:**

REMOVAL/ BLASTING OF ROCK, CLEARING AND GRUBBING, REMOVAL OF SPOILS FROM SITE, SELECT TO BE PROVIDED BY DELDOT, RESTORATION COST NOT INCLUDED, REMOVAL AND DISPOSAL OF ANY CONTAMINATED DIRT OR WATER, MAINTAINING EXISTING U.G. & AERIAL FACILITIES DURING ROAD CONSTRUCTION PHASE.

The Company will require one hundred (100) calendar days to complete the proposed manhole and conduit system and an additional ninety (90) calendar days to complete the cable and splicing work, following twenty-eight (28) calendar days advance notice of completion of clearing and grubbing, cuts and fills made, staking of rights-of-way and completion of the Utility Pre-Construction Meeting for this contract and the procurement of easements by DelDOT and receipt of "NTP".

### **New Castle County Office of Special Services (Sanitary Sewer)**

Any adjustments and/or relocations of the County's existing sanitary sewer facilities will be done by the State's Contractor in accordance with the County's Standard Specifications, as indicated on the plans and outlined elsewhere in these Special Provisions.

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### **GENERAL NOTES:**

- 1. THE UTILITIES AND THEIR CONTRACTORS DO NOT NORMALLY WORK ON WEEKENDS OR LEGAL HOLIDAYS!**
- 2. IT IS UNDERSTOOD AND AGREED THAT THE STATE'S 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**

Contract No. T200809003

INTERFERENCE FROM THE SAID UTILITY FACILITIES AND APPURTENANCES OR THE OPERATION OF MOVING THEM, EXCEPT THAT THE STATE'S CONTRACTORS MAY BE GRANTED AN EQUITABLE EXTENSION OF TIME. THE STATE'S CONTRACTOR IS RESPONSIBLE FOR THE SUPPORT AND PROTECTION OF ALL UTILITIES WHEN EXCAVATING.

3. THE STATE'S CONTRACTOR IS RESPONSIBLE FOR ROUGH GRADING AS REQUIRED BY THE ROADWAY CONSTRUCTION PRIOR TO THE UTILITY COMPANY'S PLACING THEIR PROPOSED FACILITIES, UNLESS INDICATED ON THE PLANS AND/OR OUTLINED ELSEWHERE IN THESE SPECIFICATIONS.

4. FOR EXACT LOCATION OF EXISTING FACILITIES, PLEASE CONTACT MISS UTILITY AT (800) 282-8555. 16 DEL. C. § 7405B REQUIRES NOTIFICATION TO AND MUTUALLY AGREEABLE MEASURES FROM THE PUBLIC UTILITY FROM ANY PERSON INTENDING TO CARRY ON ANY FUNCTION, ACTIVITY, WORK OR OPERATION WITHIN DANGEROUS PROXIMITY OF ANY HIGH VOLTAGE OVERHEAD LINE.

5. COORDINATION AND COOPERATION AMONG THE UTILITY COMPANIES AND THE STATE'S CONTRACTOR ARE OF PRIME IMPORTANCE. THEREFORE, THE CONTRACTOR IS DIRECTED TO CONTACT THE FOLLOWING UTILITY COMPANY REPRESENTATIVES WITH ANY QUESTIONS REGARDING THIS WORK PRIOR TO SUBMITTING BIDS AND WORK SCHEDULES. PROPOSED WORK SCHEDULES SHALL REFLECT THE UTILITY COMPANIES' PROPOSED RELOCATIONS.

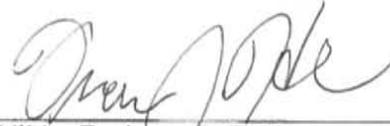
Ted Waugh	Delmarva Power (Gas)	(302) 429-3706
Angel Collazo	Delmarva Power (Electric Distribution)	(302) 454-4370
George Zang	Verizon-DE, Inc.	(610) 280-5574
Knol McRae	Comcast Cable of New Castle County	(302) 661-4431
John Licht	United Water Delaware	(302) 633-5905
Carmen Hunter	Artesian Water Company, Inc.	(302) 453-6900
Kevin Penozza	New Castle County Office of Special Services (Sanitary Sewer)	(302) 395-5723

PREPARED AND RECOMMENDED BY:

  
Rummel, Klepper & Kahl, LLP  
Consulting Engineers

04.01.2011  
Date

APPROVED AS TO FORM:

  
Utilities Engineer, DelDOT

4-13-11  
Date

DELAWARE DEPARTMENT OF TRANSPORTATION  
SCHEDULE OF ITEMS

PAGE: 1  
DATE:

CONTRACT ID: T200809003.01 PROJECT(S): IM-N056(35)

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CONTRACTOR : \_\_\_\_\_

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

SECTION 0001 ROAD

0010	201000 CLEARING AND GRUBBING	LUMP		LUMP		
0020	202000 EXCAVATION AND EMBANKMENT	314000.000 CY				
0030	202505 SETTLEMENT PLATFORM	18.000 EACH				
0040	202514 PIEZOMETER	4.000 EACH				
0050	202518 SETTLEMENT MONUMENT	57.000 EACH				
0060	202555 SUBSOIL TILLAGE	2700.000 SY				
0070	207000 EXCAVATION AND BACKFILL FOR STRUCTURES	3415.000 CY				
0090	208000 EXCAVATION AND BACKFILLING FOR PIPE TRENCHES	9249.000 CY				
0100	208500 FLOWABLE FILL	160.000 CY				
0110	209001 BORROW, TYPE A	3325.000 CY				

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DELAWARE DEPARTMENT OF TRANSPORTATION  
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CONTRACT ID: T200809003.01 PROJECT(S): IM-N056(35)

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LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
0120	209002 BORROW, TYPE B	5250.000 CY				
0130	209006 BORROW, TYPE F	86300.000 CY				
0140	210000 FURNISHING BORROW TYPE "C" FOR PIPE, UTILITY TRENCH, AND STRUCTURE BACKFILL	5722.000 CY				
0150	211000 REMOVAL OF STRUCTURES AND OBSTRUCTIONS	LUMP	LUMP			
0160	211002 REMOVAL OF STRUCTURES AND OBSTRUCTIONS (GUARDRAIL)	11500.000 LF				
0170	211004 REMOVAL OF STRUCTURES AND OBSTRUCTIONS (PIPE)	1065.000 LF				
0180	211521 ABANDONMENT OF WELLS	41.000 EACH				
0190	211523 REMOVAL OF P.C.C. BARRIER	7140.000 LF				
0200	212000 UNDERCUT EXCAVATION	2500.000 CY				
0210	212001 UNDERCUT EXCAVATION, PATCHING	50.000 CY				

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LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
0220	250000 SEDIMENT REMOVAL	1656.000 CY				
0230	251001 REINFORCED SILT FENCE	25635.000 LF				
0240	252000 INLET SEDIMENT CONTROL, DRAINAGE INLET	622.000 EACH				
0250	254000 STONE CHECK DAM	240.000 TON				
0260	255000 SEDIMENT TRAP	119.000 CY				
0270	257000 RIPRAP DITCH	55.000 CY				
0280	258000 TEMPORARY SWALE, TYPE A-1	3500.000 LF				
0290	261000 TEMPORARY SLOPE DRAIN, 12"	50.000 LF				
0300	263000 SUMP PIT, TYPE 1	2.000 EACH				
0310	268000 STABILIZED CONSTRUCTION ENTRANCE	1400.000 TON				

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LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
0320	270000 PORTABLE SEDIMENT TANK	3.000 EACH				
0325	271000 STORMWATER MANAGEMENT POND	750.000 CY	15.00000		11250.00	
0330	302007 GRADED AGGREGATE BASE COURSE, TYPE B	40085.000 CY				
0340	302008 GRADED AGGREGATE BASE COURSE, TYPE B, PATCHING	414.000 CY				
0350	302012 DELAWARE NO. 57 STONE	364.000 TON				
0360	401654 SUPERPAVE, TYPE B HOT-MIX, 160 GYRATIONS, PG 70-22	15813.000 TON				
0370	401660 SUPERPAVE, TYPE B HOT-MIX, 160 GYRATIONS, PG 76-22	12161.000 TON				
0380	401663 SUPERPAVE, BITUMINOUS CONCRETE BASECOURSE, 160 GYRATIONS, PG 64-22	36591.000 TON				
0390	401665 SUPERPAVE, TYPE C HOT-MIX, 160 GYRATIONS, PG 64-22, PATCHING	79.000 TON				
0400	401666 SUPERPAVE, TYPE B HOT-MIX, 160 GYRATIONS, PG 64-22, PATCHING	236.000 TON				

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			DOLLARS	CTS	DOLLARS	CTS
0410	401667 SUPERPAVE, BITUMINOUS CONCRETE BASECOURSE, 160 GYRATIONS, PG 64-22 PATCHING	423.000 TON				
0420	401668 SUPERPAVE, TYPE C HOT-MIX, 160 GYRATIONS, PG 64-22, WEDGE	1415.000 TON				
0430	401669 SUPERPAVE, TYPE B HOT-MIX, 160 GYRATIONS, PG 64-22, WEDGE	60.000 TON				
0440	401708 SUPERPAVE, TYPE C HOT-MIX, 160 GYRATIONS, PG 70-22, (NON-CARBONATE STONE)	15404.000 TON				
0450	401711 SUPERPAVE, TYPE C HOT-MIX, 160 GYRATIONS, PG 76-22, (NON-CARBONATE STONE)	12865.000 TON				
0460	501006 PORTLAND CEMENT CONCRETE PAVEMENT, 12"	57497.000 SY				
0470	601502 TEMPORARY PROTECTIVE SHIELD	LUMP	LUMP			
0480	602579 DRILLING HOLES AND INSTALLING DOWELS	240.000 EACH				
0490	602580 PARTIAL REMOVAL OF P.C.C. MASONRY	14.000 CY				

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			DOLLARS	CTS	DOLLARS	CTS
0500	602717 REHABILITATION OF CONCRETE STRUCTURES, PIERS AND ABUTMENTS	141.000 CF				
0510	602772 MECHANICALLY STABILIZED EARTH WALLS	LUMP	LUMP			
0520	602773 PCC MASONRY FOR MECHANICALLY STABILIZED EARTH WALLS	LUMP	LUMP			
0530	602774 PCC MASONRY FOR LIGHT POLE FOUNDATIONS	304.000 CY				
0540	602785 P.C.C. MASONRY, SUBSTRUCTURE, 6000 PSI	252.000 CY				
0550	602786 P.C.C. MASONRY, SUBSTRUCTURES, 8000 PSI	472.000 CY				
0560	602787 POST TENSIONING PIER CAP, BONDED SYSTEM	LUMP	LUMP			
0570	605002 STEEL STRUCTURES	LUMP	LUMP			
0580	605500 CANTILEVER SIGN SUPPORTS AND FOUNDATION	LUMP	LUMP			
0590	605511 PREFABRICATED EXPANSION JOINT SYSTEM, 3"	240.000 LF				

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			DOLLARS	CTS	DOLLARS	CTS
0600	605512 PREFABRICATED EXPANSION JOINT SYSTEM, 4"	72.000 LF				
0610	605513 PREFABRICATED EXPANSION JOINT SYSTEM, 5"	182.000 LF				
0620	605523 BOX TRUSS TYPE OVERHEAD SIGN SUPPORT AND FOUNDATION	LUMP		LUMP		
0630	605581 ELASTOMERIC BRIDGE BEARING PAD	6.000 EACH				
0640	605658 STRIP SEAL EXPANSION JOINT, 2"	31.000 LF				
0650	605750 NON-GUIDED POT BEARING AT ABUTMENT	LUMP		LUMP		
0660	605751 GUIDED POT BEARING AT ABUTMENT	LUMP		LUMP		
0670	605752 NON-GUIDED POT BEARING AT PIER	LUMP		LUMP		
0680	605753 GUIDED POT BEARING AT PIER	LUMP		LUMP		
0690	605754 FIXED POT BEARING AT PIER	LUMP		LUMP		

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LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
0700	605757 HIGH PERFORMANCE STEEL	LUMP	LUMP			
0710	612021 REINFORCED CONCRETE PIPE, 15", CLASS IV	4027.000 LF				
0720	612022 REINFORCED CONCRETE PIPE, 18", CLASS IV	7993.000 LF				
0730	612023 REINFORCED CONCRETE PIPE, 24", CLASS IV	3811.000 LF				
0740	612025 REINFORCED CONCRETE PIPE, 30", CLASS IV	2430.000 LF				
0750	612027 REINFORCED CONCRETE PIPE, 42", CLASS IV	2920.000 LF				
0760	612028 REINFORCED CONCRETE PIPE, 48", CLASS IV	288.000 LF				
0770	612030 REINFORCED CONCRETE PIPE, 18", CLASS V	492.000 LF				
0780	612033 REINFORCED CONCRETE PIPE, 21", CLASS IV	17.000 LF				
0790	612034 REINFORCED CONCRETE PIPE, 36", CLASS IV	1896.000 LF				

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LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
0800	612529 PIPE VIDEO INSPECTION	24800.000 LF				
0810	612535 CLEANING DRAINAGE PIPE, 15"-24" DIA	229.000 LF				
0820	612536 CLEANING DRAINAGE PIPE, GREATER THAN 24" DIA	339.000 LF				
0830	612537 HEAVY CLEANING OF DRAINAGE PIPE	50.000 HOUR				
0840	614003 GALVANIZED CORRUGATED STEEL PIPE, 18", 16 GAGE, 2 2/3" X 1/2" CORRUGATION	304.000 LF				
0860	614605 STEEL CASING PIPE, 12"	75.000 LF				
0870	617003 REINFORCED CONCRETE FLARED END SECTION, 18"	1.000 EACH				
0880	617011 REINFORCED CONCRETE FLARED END SECTION, 48"	1.000 EACH				
0890	617515 HEADWALL	4.000 EACH				
0900	618540 FURNISH STEEL PIPE PILES, 24"	3885.000 LF				

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LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
0910	618541 FURNISH STEEL PIPE PILES, 30"	580.000 LF				
0920	618542 FURNISH STEEL PIPE PILES, 36"	9069.000 LF				
0930	618543 FURNISH STEEL PIPE TEST PILES, 24"	1075.000 LF				
0940	618544 FURNISH STEEL PIPE TEST PILES, 30"	83.000 LF				
0950	618545 FURNISH STEEL PIPE TEST PILES, 36"	1232.000 LF				
0960	618546 INSTALL STEEL PIPE PILES, 24"	3885.000 LF				
0970	618547 INSTALL STEEL PIPE PILES, 30"	580.000 LF				
0980	618548 INSTALL STEEL PIPE PILES, 36"	9069.000 LF				
0990	618549 INSTALL STEEL PIPE TEST PILES, 24"	1075.000 LF				
1000	618550 INSTALL STEEL PIPE TEST PILES, 30"	83.000 LF				

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			DOLLARS	CTS	DOLLARS	CTS
1010	618551 INSTALL STEEL PIPE TEST PILES, 36"	1232.000 LF				
1020	619501 PRODUCTION PILE RESTRIKE	60.000 EACH	500.00000		30000.00	
1030	619502 TEST PILE RESTRIKE	28.000 EACH	1000.00000		28000.00	
1040	619519 DYNAMIC PILE TESTING BY CONTRACTOR	70.000 EACH				
1050	619539 SIGNAL MATCHING ANALYSIS BY CONTRACTOR	70.000 EACH				
1060	623002 PRESTRESSED REINFORCED CONCRETE MEMBERS, BOX-BEAMS		LUMP	LUMP		
1070	701010 PORTLAND CEMENT CONCRETE CURB, TYPE 1	701.000 LF				
1080	701020 INTEGRAL PORTLAND CEMENT CONCRETE CURB AND GUTTER, TYPE 1	440.000 LF				
1090	701023 INTEGRAL PORTLAND CEMENT CONCRETE CURB AND GUTTER, TYPE 4	1029.000 LF				
1100	701026 PORTLAND CEMENT CONCRETE MONOLITHIC MEDIAN	65.000 LF				

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LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
1110	708051 DRAINAGE INLET, 34" X 24"	42.000 EACH				
1120	708052 DRAINAGE INLET, 48" X 30"	15.000 EACH				
1130	708053 DRAINAGE INLET, 48" X 48"	10.000 EACH				
1140	708057 DRAINAGE INLET, 72" X 24"	60.000 EACH				
1150	708058 DRAINAGE INLET, 72" X 48"	53.000 EACH				
1160	708059 DRAINAGE INLET, 72" X 72"	8.000 EACH				
1170	708107 MANHOLE, ROUND	4.000 EACH				
1180	708111 MANHOLE, 48" X 30"	32.000 EACH				
1190	708112 MANHOLE, 48" X 48"	1.000 EACH				
1200	708113 MANHOLE, 66" X 30"	3.000 EACH				

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LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
1210	708115 MANHOLE, 66" X 66"	1.000 EACH				
1220	708500 REPLACING CATCH BASIN GRATES	5.000 EACH				
1230	708504 REPLACING CATCH BASIN FRAMES	5.000 EACH				
1240	708512 DRAINAGE INLET, SPECIAL I	1.000 EACH				
1250	708513 DRAINAGE INLET, SPECIAL II	8.000 EACH				
1260	708515 DRAINAGE INLET, SPECIAL IV	2.000 EACH				
1270	708516 DRAINAGE INLET, SPECIAL V	1.000 EACH				
1280	708517 DRAINAGE INLET, SPECIAL VI	2.000 EACH				
1290	708518 DRAINAGE INLET, SPECIAL VII	2.000 EACH				
1300	708537 REMOVE CATCH BASIN	14.000 EACH				

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			DOLLARS	CTS	DOLLARS	CTS
1310	708579 ABANDON EXISTING MANHOLE	32.000 EACH				
1320	708582 MANHOLE, SPECIAL I	1.000 EACH				
1330	708583 PERSONAL GRATE FOR PIPE INLET	2.000 EACH				
1340	708596 MANHOLE, SPECIAL II	1.000 EACH				
1350	708597 MANHOLE, SPECIAL III	1.000 EACH				
1360	708653 DRAINAGE INLET, SPECIAL VIII	1.000 EACH				
1370	708654 DRAINAGE INLET, SPECIAL IX	2.000 EACH				
1380	708655 DRAINAGE INLET, SPECIAL X	2.000 EACH				
1390	708656 DRAINAGE INLET, SPECIAL XI	1.000 EACH				
1400	710001 ADJUSTING AND REPAIRING EXISTING DRAINAGE INLET	4.000 EACH				

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			DOLLARS	CTS	DOLLARS	CTS
1410	710002 ADJUSTING AND REPAIRING EXISTING MANHOLE	2.000 EACH				
1420	712006 RIPRAP, R-5	584.000 SY				
1430	712007 RIPRAP, R-6	480.000 SY				
1440	712531 CHANNEL BED FILL	29.000 CY				
1450	713003 GEOTEXTILES, RIPRAP	672.000 SY				
1460	715001 PERFORATED PIPE UNDERDRAINS, 6"	49552.000 LF				
1470	715500 UNDERDRAIN OUTLET PIPE, 6"	1146.000 LF				
1480	715506 TEMPORARY DRAINAGE PIPE, 24"	1960.000 LF				
1490	715507 TEMPORARY DRAINAGE PIPE, 36"	30.000 LF				
1500	720010 TREATED WOOD BLOCK	380.000 EACH				

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LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
1510	720050 GALVANIZED STEEL BEAM GUARDRAIL, TYPE 1-31	9075.000 LF				
1520	720051 GALVANIZED STEEL BEAM GUARDRAIL, TYPE 2-31	250.000 LF				
1530	720506 RELOCATING PORTABLE P.C.C. SAFETY BARRIER	16425.000 LF				
1550	720517 IMPACT ATTENUATOR, TYPE I	22.000 EACH				
1560	720532 INSTALL PORTABLE IMPACT ATTENUATOR	14.000 EACH				
1570	720534 FURNISH PORTABLE IMPACT ATTENUATOR	16.000 EACH				
1580	720539 RELOCATE PORTABLE IMPACT ATTENUATOR	26.000 EACH				
1590	720544 REFLECTORS, WHITE, CONCRETE	339.000 EACH				
1600	720545 REFLECTORS, YELLOW, CONCRETE	396.000 EACH				
1610	720552 REFLECTOR PANELS	459.000 EACH				

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			DOLLARS	CTS	DOLLARS	CTS
1620	720567 FURNISH AND MAINTAIN PORTABLE P.C.C. SAFETY BARRIER	21089.000 LF				
1630	720585 GUARDRAIL END TREATMENT ATTENUATOR, TYPE 1-31	18.000 EACH				
1640	720612 IMPACT ATTENUATOR, SPECIAL	5.000 EACH				
1650	720651 PCC SAFETY BARRIER PERMANENT, DOUBLE FACE BIFURCATED TYPE I	6549.000 LF				
1660	720652 PCC SAFETY BARRIER PERMANENT, DOUBLE FACED BIFURCATED TYPE 2	616.000 LF				
1670	720654 PCC SAFETY BARRIER PERMANENT, SINGLE FACE, MODIFIED TYPE I	2891.000 LF				
1680	720655 PCC SAFETY BARRIER PERMANENT, SINGLE FACE, MODIFIED, TYPE 2	20380.000 LF				
1690	720656 PCC SAFETY BARRIER PERMANENT, SINGLE FACE, MODIFIED, TYPE 3	170.000 LF				
1700	720657 PCC SAFETY BARRIER PERMANENT, SINGLE FACE, MODIFIED, TYPE 4	199.000 LF				

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			DOLLARS	CTS	DOLLARS	CTS
1710	720658 PCC SAFETY BARRIER PERMANENT, SINGLE FACE, MODIFIED TYPE 5	72.000 LF				
1720	725001 GUARDRAIL TO BARRIER CONNECTION (EXIT TYPE 31)	7.000 EACH				
1730	725002 GUARDRAIL TO BARRIER CONNECTION, APPROACH TYPE 1-31	4.000 EACH				
1740	726001 END ANCHORAGE 31	20.000 EACH				
1750	727014 CONSTRUCTION SAFETY FENCE	7000.000 LF				
1760	732002 TOPSOIL, 6" DEPTH	135908.000 SY				
1770	733002 TOPSOILING, 6" DEPTH	10900.000 SY				
1780	734013 PERMANENT GRASS SEEDING, DRY GROUND	146608.000 SY				
1790	734015 PERMANENT GRASS SEEDING, WET GROUND	361.000 SY				
1800	734017 TEMPORARY GRASS SEEDING, DRY GROUND	649329.000 SY				

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			DOLLARS	CTS	DOLLARS	CTS
1810	735006 MULCHING, STRAW	649329.000 SY				
1815	734018 TEMPORARY GRASS SEEDING, WET GROUND	610.000 SY				
1820	735533 SOIL RETENTION BLANKET MULCH, TYPE 3	53600.000 SY				
1830	735534 SOIL RETENTION BLANKET MULCH, TYPE 4	79500.000 SY				
1840	735535 SOIL RETENTION BLANKET MULCH, TYPE 5	14398.000 SY				
1850	735536 SOIL RETENTION BLANKET MULCH, TYPE 6	143.000 SY				
1860	736502 MOWING	792.000 ACRE				
1870	737527 INTERCHANGE TREE PLANTING	LUMP	LUMP			
1880	743003 ARROWPANELS, TYPE C	8423.000 EADY				
1890	743004 FURNISH AND MAINTAIN PORTABLE CHANGEABLE MESSAGE SIGN	866.000 EADY				

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			DOLLARS	CTS	DOLLARS	CTS
1900	743005 FURNISH AND MAINTAIN PORTABLE LIGHT ASSEMBLY	2067.000 EADY				
1910	743006 PLASTIC DRUMS	526330.000 EADY				
1920	743007 TRAFFIC OFFICERS	24000.000 HOUR	75.00000		1800000.00	
1930	743050 FLAGGER, NEW CASTLE COUNTY, STATE	1197.000 HOUR	41.67000		49878.99	
1940	743062 FLAGGER, NEW CASTLE COUNTY, STATE, OVERTIME	243.000 HOUR	60.42000		14682.06	
1950	743501 WARNING LIGHTS , TYPE B	11091.000 EADY				
1960	743504 WARNING SIGNS	802.000 EACH				
1970	743507 TEMPORARY BARRICADE, TYPE III	329.000 LFDY				
1980	743524 TEMPORARY BARRICADES, TYPE III	91.000 EACH				
1990	743525 TEMPORARY WARNING SIGNS	29249.000 EADY				

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			DOLLARS	CTS	DOLLARS	CTS
2000	743537 FURNISH AND MAINTAIN TRUCK-MOUNTED ATTENUATOR, TYPE II	1518.000 EACH				
2010	744505 ADJUST OR REPAIR EXISTING CONDUIT JUNCTION WELL	2.000 EACH				
2020	744506 CONDUIT JUNCTION WELL, TYPE 7, 36" X 60" PRECAST POLYMER CONCRETE	11.000 EACH				
2030	744520 CONDUIT JUNCTION WELL, TYPE 1, 20" X 20" PRECAST CONCRETE	76.000 EACH				
2040	744523 CONDUIT JUNCTION WELL, TYPE 4, 20" X 42" 1/2" PRECAST CONCRETE	38.000 EACH				
2050	744525 REMOVAL OF EXISTING JUNCTION WELL	34.000 EACH				
2060	744529 P.C.C. BARRIER JUNCTION WELL	4.000 EACH				
2070	745521 SUPPLY OF 4" SDR-13.5 HDPE CONDUIT	1577.000 LF				
2080	745524 SUPPLY OF 4" SCHEDULE 80 PVC CONDUIT	13575.000 LF				
2090	745526 SUPPLY OF 3" GALVANIZED STEEL CONDUIT	19290.000 LF				

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			DOLLARS	CTS	DOLLARS	CTS
2100	745527 SUPPLY OF 2 1/2" GALVANIZED STEEL CONDUIT LF	1595.000				
2110	745528 SUPPLY OF 2" GALVANIZED STEEL CONDUIT LF	5165.000				
2120	745529 SUPPLY OF 1 1/2" GALVANIZED STEEL CONDUIT LF	290.000				
2130	745530 SUPPLY OF 1" GALVANIZED STEEL CONDUIT LF	1065.000				
2140	745531 SUPPLY OF 3/4" GALVANIZED STEEL CONDUIT LF	350.000				
2150	745537 SUPPLY OF 3/4" FLEXIBLE METALLIC LIQUIDTIGHT CONDUIT LF	105.000				
2160	745538 SUPPLY OF 1 1/2" FLEXIBLE METALLIC-LIQUIDTIGHT CONDUIT LF	555.000				
2170	745542 INSTALLATION OF CONDUIT UNDER EXISTING PAVEMENT-DIRECTIONAL BORE LF	3272.000				
2180	745544 INSTALLATION OF CONDUIT IN UNPAVED TRENCH LF	16295.000				
2190	745546 INSTALLATION OF CONDUIT ON STRUCTURE LF	555.000				

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DELAWARE DEPARTMENT OF TRANSPORTATION  
SCHEDULE OF ITEMS

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DATE:

CONTRACT ID: T200809003.01 PROJECT(S): IM-N056(35)

All figures must be typewritten.

CONTRACTOR : \_\_\_\_\_

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
2200	745547 INSTALLATION OF ADDITIONAL CONDUITS IN TRENCH OR OPEN CUT PAVEMENT	1990.000 LF				
2210	745549 INSTALLATION OF BRIDGE-MOUNTED CONDUIT FROM WORK AREA ABOVE BRIDGE DECK	1525.000 LF				
2230	746511 CABLES, 1/#4 AWG	7370.000 LF				
2240	746512 CABLES, 1/#6 AWG	38490.000 LF				
2250	746513 CABLES, 1/#8 AWG	40321.000 LF				
2260	746514 CABLES, 1/#10 AWG	770.000 LF				
2270	746515 INSULATED GROUND CABLES, 1/#6	9042.000 LF				
2280	746518 ALUMINUM LIGHTING STANDARD WITH SINGLE DAVIT ARM, 35' POLE	32.000 EACH				
2290	746519 ALUMINUM LIGHTING STANDARD WITH SINGLE DAVIT ARM, 40' POLE	24.000 EACH				
2300	746527 CABLES, 1/#2 AWG	4752.000 LF				

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LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
2320	746537 RELOCATING EXISTING LIGHT STANDARDS	2.000 EACH				
2330	746552 FURNISH AND MAINTAIN TEMPORARY LIGHTING	LUMP	LUMP			
2340	746564 INSULATED GROUND CABLES, 1/#4	1795.000 LF				
2350	746577 INSULATED GROUND CABLE, 1/#8	11055.000 LF				
2360	746592 REPLACE/ADAPT EXISTING TRANSFORMER BASE	2.000 EACH				
2370	746594 LUMINAIRE (HPS), 250 WATT	4.000 EACH				
2380	746596 JUNCTION BOX ON STRUCTURE	9.000 EACH				
2390	746598 INSULATED GROUND CABLE , 1/#2	1717.000 LF				
2400	746605 INSULATED GROUND CABLE, 1/#10	386.000 LF				
2410	746620 RELOCATION OF EXISTING LIGHTING TOWER	1.000 EACH				

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CONTRACTOR : \_\_\_\_\_

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
2420	746621 LIGHTING TOWER AND INSTALLATION	7.000 EACH				
2430	746622 CABLES, 1/#4/0 AWG	340.000 LF				
2440	746653 ELECTRICAL TESTING	LUMP	LUMP			
2450	746716 ELECTRIC SERVICE ON PEDESTAL	2.000 EACH				
2480	746774 SUPPLY AND INSTALLATION OF LOOP DETECTOR WIRE	1210.000 LF				
2490	746787 REMOVAL OF CABLE FROM CONDUIT OR POLE	1300.000 LF				
2500	746811 INSTALLATION OR REMOVAL OF LIGHTINGPOLE W/ MAST ARM	32.000 EACH				
2510	746816 REMOVAL OF LUMINAIRE	36.000 EACH				
2520	746830 REMOVAL OF CONCRETE POLE BASES AND CABINET FOUNDATIONS	19.000 CY				
2530	746847 POLE BASE, TYPE 3	8.000 EACH				

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CONTRACTOR : \_\_\_\_\_

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
2540	746876 UNDERPASS LIGHT FIXTURE	12.000 EACH				
2550	747504 INSTALLATION OR REMOVAL OF POLE OR POST MOUNTED CABINET	4.000 EACH				
2560	747506 CABINET BASE	8.000 EACH				
2570	747509 LIGHTING CONTROL CENTER - 200A, 277/480V	2.000 EACH				
2580	748015 PERMANENT PAVEMENT STRIPING, SYMBOL/LEGEND ALKYD-THERMOPLAST IC	582.000 SF				
2590	748020 TEMPORARY MARKINGS, PAINT, 6"	52939.000 LF				
2600	748027 PERMANENT PAVEMENT STRIPING, ALKYD-THERMOPLASTIC, 12"	570.000 LF				
2610	748502 RAISED/RECESSED PAVEMENT MARKER	1582.000 EACH				
2620	748506 PERMANENT PAVEMENT STRIPING, EPOXY RESIN PAINT, 4"	12440.000 LF				
2630	748507 PERMANENT PAVEMENT STRIPING, EPOXY RESIN PAINT, 6"	146137.000 LF				

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CONTRACTOR : \_\_\_\_\_

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
2640	748508 PERMANENT PAVEMENT STRIPING, EPOXY RESIN PAINT, 8"	340.000 LF				
2650	748509 PERMANENT PAVEMENT STRIPING, EPOXY RESIN PAINT, 12"	22410.000 LF				
2660	748526 TEMPORARY MARKINGS, TAPE, 6"	4950.000 LF				
2670	748530 REMOVAL OF PAVEMENT STRIPING	15125.000 SF				
2680	748539 PERMANENT PAVEMENT STRIPING, EPOXY RESIN PAINT, BLACK, 12"	360.000 LF				
2690	748540 PERMANENT PAVEMENT STRIPING, EPOXY RESIN PAINT, BLACK, 16"	100.000 LF				
2700	748547 RETROREFLECTIVE PREFORMED PATTERNED CONTRAST MARKINGS, 9"	390.000 LF				
2710	748557 PERMANENT PAVEMENT STRIPING, EPOXY RESIN PAINT, BLACK, 3"	4200.000 LF				
2720	749500 SIGN PANEL	23224.000 SF				
2730	749511 INSTALLATION OR REMOVAL OF SIGN ON ROADSIDE I-BEAM STRUCTURE	280.000 SF				

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CONTRACTOR : \_\_\_\_\_

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
2740	749514 INSTALLATION OF SIGN OVERLAY OVER 16 S.F.	192.000 EACH				
2750	749516 REINFORCED CONCRETE SIGN FOUNDATION, W-6	1.000 EACH				
2760	749519 REINFORCED CONCRETE SIGN FOUNDATION, W-12	2.000 EACH				
2770	749521 SUPPLY OF BREAKAWAY I-BEAM SIGN POSTS, W-6	16.000 LF				
2780	749524 SUPPLY OF BREAKAWAY I-BEAM SIGN POSTS, W-12	46.000 LF				
2790	749550 INSTALLATION OF BREAKAWAY I-BEAM SIGN POSTS	3.000 EACH				
2800	749559 SUPPLY OF JERSEY BARRIER MOUNTED I-BEAM	3.000 EACH				
2810	749560 INSTALLATION OF JERSEY BARRIER MOUNTED I-BEAM	3.000 EACH				
2820	749561 INSTALLATION OF SIGN ON JERSEY BARRIER MOUNTED I-BEAM	485.000 SF				
2830	749687 INSTALLATION OR REMOVAL OF TRAFFIC SIGN(S) ON SINGLE SIGN POST	160.000 EACH				

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CONTRACTOR : \_\_\_\_\_

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
2840	758000 REMOVAL OF EXISTING PORTLAND CEMENT CONCRETE PAVEMENT, CURB, SIDEWALK, ETC.	17730.000 SY				
2850	759501 FIELD OFFICE, SPECIAL	42.000 EAMO				
2860	760504 RUMBLE STRIPS, HOT MIX	125000.000 LF				
2870	760507 PROFILE MILLING, HOT-MIX	91464.000 SYIN				
2880	762001 SAW CUTTING, HOT MIX	18308.000 LF				
2890	762002 SAW CUTTING, CONCRETE, FULL DEPTH	1540.000 LF				
2900	763000 INITIAL EXPENSE		LUMP	LUMP		
2910	763500 MAINTENANCE OF TRAFFIC		LUMP	LUMP		
2920	763501 CONSTRUCTION ENGINEERING		LUMP	LUMP		
2930	763503 TRAINEE	1080.000 HOUR		0.80000		864.00

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CONTRACTOR : \_\_\_\_\_

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
2940	763508 PROJECT CONTROL SYSTEM DEVELOPMENT PLAN	LUMP	LUMP			
2950	763509 CPM SCHEDULE UPDATES AND/OR REVISED UPDATES	42.000 EAMO				
2960	602007 PORTLAND CEMENT CONCRETE MASONRY, PIER ABOVE FOOTING, CLASS A	1003.000 CY				
2970	602011 PORTLAND CEMENT CONCRETE MASONRY, SUBSTRUCTURE, CLASS A	2514.000 CY				
2980	602013 PORTLAND CEMENT CONCRETE MASONRY, SUPERSTRUCTURE, CLASS D	4286.000 CY				
2990	602014 PORTLAND CEMENT CONCRETE MASONRY, APPROACH SLAB, CLASS D	591.000 CY				
3000	602015 PORTLAND CEMENT CONCRETE MASONRY, ABUTMENT ABOVE FOOTING, CLASS A	803.000 CY				
3010	602017 PORTLAND CEMENT CONCRETE MASONRY, PARAPET, CLASS A	2440.000 CY				
3020	603000 BAR REINFORCEMENT	491000.000 LB				
3030	604000 BAR REINFORCEMENT, EPOXY COATED	2521000.000 LB				

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CONTRACTOR : \_\_\_\_\_

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
3040	712005 RIPRAP, R-4	7310.000				
		SY				
3050	720529 P.C.C. SAFETY BARRIER PERMANENT, SINGLE FACE	17167.000				
		LF				
3060	746852 POLE BASE, TYPE 6	10.000				
		EACH				
3070	748535 PERMANENT PAVEMENT STRIPING, EPOXY RESIN PAINT, BLACK, 4"	180.000				
		LF				
	SECTION 0001 TOTAL					
	ITEMS TOTAL					

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**SPECIAL BIDDING PROCEDURE  
T200809003.01**

**THE BELOW FORM MUST BE COMPLETED AND SUBMITTED WITH THE BID**

Contractor: \_\_\_\_\_

The dollar amount for all work to be performed  
under the proposal.

Part A = \_\_\_\_\_  
(Total Bid Amount of Section 0001)

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Total number of calendar days (includes Weather Days as calculated  
from Table 1 under item 763564 - Special Bidding Procedures)

\_\_\_\_\_

Number of calendar days above multiplied by \$35,000.00

Part B = \$ \_\_\_\_\_

Price for comparison of bids - TOTAL

\$ \_\_\_\_\_  
TOTAL OF "A" ABOVE, PLUS "B" ABOVE

SECTION 1		BREAKOUT SHEET - 2A		CONTRACT NO. T200809003	
ITEM 602772 - MECHANICALLY STABILIZED EARTH WALLS					
ITEM NO.	APPROX. QTY.	UOM	DESCRIPTION	UNIT PRICE	AMOUNT
11	1	LS	Wall 12 MSE Wall	\$	\$
12	1	LS	Wall 13 MSE Wall	\$	\$
13	1	LS	Wall 14 MSE Wall	\$	\$
14	1	LS	Wall 15 MSE Wall	\$	\$
15	1	LS	Wall 16 MSE Wall	\$	\$
16	1	LS	MSE Wall at S1	\$	\$
17	1	LS	MSE Wall at S2	\$	\$
18	1	LS	MSE Wall at S3	\$	\$
19	1	LS	MSE Wall at S4	\$	\$
20	1	LS	MSE Wall at S5	\$	\$
21	1	LS	MSE Wall at S6	\$	\$
TOTAL ITEM 602772 - MECHANICALLY STABILIZED EARTH WALLS				\$ _____	
				(LUMP SUM BID PRICE FOR ITEM 602772)	

CANNOT BE

SECTION 1		BREAKOUT SHEET - 13		CONTRACT NO. T200809003	
ITEM 605757 - HIGH PERFORMANCE STEEL					
ITEM NO.	APPROX. QTY.	UOM	DESCRIPTION	UNIT PRICE	AMOUNT
1	732,000	LB	Bridge S1	\$	\$
2	182,000	LB	Bridge S6	\$	\$
TOTAL ITEM 605757 - HIGH PERFORMANCE STEEL				\$	
				(LUMP SUM BID PRICE FOR ITEM 605757)	

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BIDDING

**CANNOT BE  
FORM SHEETS**

THE FOLLOWING SHEETS MUST BE COMPLETED AND RETURNED WITHIN 10 CALENDAR DAYS BY THE APPARENT LOW BIDDER. FAILURE TO COMPLETE THE FORM SHEETS AS REQUIRED WILL RESULT IN THE BID BEING DECLARED NON-RESPONSIVE AND THE BID WILL NOT BE CONSIDERED. FORM SHEETS MUST BE COMPLETED REGARDLESS OF WHETHER BIDDING BY ELECTRONIC MEANS OR TYPEWRITTEN HARD COPY.

**USED FOR  
BIDDING**

CANNOT BE  
USED FOR  
BIDDING

SECTION 1		FORM - 1 for Item 720532		CONTRACT NO. T200809003	
ITEM 720532 - INSTALL PORTABLE IMPACT ATTENUATOR					
ITEM NO.	APPROX. QTY.	UOM	DESCRIPTION	UNIT PRICE	AMOUNT
				\$	\$
				\$	\$
				\$	\$
				\$	\$
				\$	\$
TOTAL MUST EQUAL BID PRICE FOR ITEM 720532 - INSTALL PORTABLE IMPACT ATTENUATOR				\$	
					(BID PRICE FOR ITEM 720532)

CANNOT BE  
USED FOR  
BIDDING

SECTION 1		FORM - 2 for Item 720534		CONTRACT NO. T200809003	
ITEM 720534 - FURNISH PORTABLE IMPACT ATTENUATOR					
ITEM NO.	APPROX. QTY.	UOM	DESCRIPTION	UNIT PRICE	AMOUNT
				\$	\$
				\$	\$
				\$	\$
				\$	\$
				\$	\$
TOTAL MUST EQUAL BID PRICE FOR ITEM 720534 - FURNISH PORTABLE IMPACT ATTENUATOR				\$	_____
				(BID PRICE FOR ITEM 720534)	

CANNOT BE  
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**Diesel Fuel Cost Price Adjustment Option**

The Bidder is required to submit this form within 10 calendar day of the bid opening.

OPTION-IN

Checking here selects the option to participate in the 763626 - Diesel Fuel Cost Price Adjustment.

OPTION-OUT

Checking here declines the option to participate in the 763626 - Diesel Fuel Cost Price Adjustment.

The undersigned hereby certifies that he/she is authorized to make this Option on behalf of the bidder in compliance with the special provision 763626 - Diesel Fuel Cost Price Adjustment.

Sealed and dated this \_\_\_\_\_ day of \_\_\_\_\_ in the year of our Lord two thousand and \_\_\_\_\_ ( 20\_\_ ).

\_\_\_\_\_  
Name of Bidder (Organization)  
Corporate Seal By: \_\_\_\_\_  
Authorized Signature

Attest \_\_\_\_\_  
Title

SWORN TO AND SUBSCRIBED BEFORE ME this \_\_\_\_ day of \_\_\_\_\_, 20\_\_.

Notary Seal \_\_\_\_\_  
BIDDING  
Notary