STATE OF DELAWARE

This Copy is for information only.
You must request a CD from
DelDOT in order to bid.

DEPARTMENT OF TRANSPORTATION

BID PROPOSAL

for

CONTRACT T201330009.01

FEDERAL AID PROJECT NO. ESTP-N061(01)

INDUSTRIAL TRACK GREENWAY PHASE III

NEW CASTLE COUNTY

ADVERTISEMENT DATE: February 8, 2016

PROSPECTIVE BIDDERS ARE ADVISED THAT THERE WILL BE A PRE-BID MEETING WEDNESDAY, FEBRUARY 24, 2016 AT 2:00 P.M. IN THE DelDOT ADMINISTRATION BUILDING, 800 BAY ROAD, DOVER, DELAWARE, 19903.

COMPLETION TIME: 488 Calendar Days

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

Bids will be received in the Bidder's Room at the Delaware Department of Transportation's Administration Building, 800 Bay Road, Dover, Delaware until 2:00 P.M. local time **March 15, 2016**

Contract No.T201330009.01
Federal Aid Project No. ESTP-N061(01)

INDUSTRIAL TRACK GREENWAY PHASE III
NEW CASTLE COUNTY

GENERAL DESCRIPTION

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 for this contract. This project includes the construction of a multi-use trail facility across the Christina River and through the Peterson Wildlife area connecting into the Wilmington Riverfront. The project will involve the construction of a pedestrian/bike bridge crossing the Christina River and an elevated boardwalk structure through the Peterson Wildlife area. The project includes the construction of 3 bridge structures and other site amenities, and other incidental construction in accordance with the location, notes and details shown on the plans and as directed by the Engineer.

COMPLETION TIME

All work on this contract must be complete within 488 Calendar Days. The Contract Time includes an allowance for 72 Weather Days. It is the Department's intent to issue a Notice to Proceed such that work starts on or about April 13, 2016.

PROSPECTIVE BIDDERS NOTES:

1. BIDDERS MUST BE REGISTERED with DelDOT and request a cd of the official plans and specifications in order to submit a bid. Contact DelDOT at dot-ask@state.de.us, or (302) 760-2031.
2. QUESTIONS regarding this project are to be e-mailed to dot-ask@state.de.us no less than six business days prior to the bid opening date in order to receive a response. Please include T201330009.01 in the subject line. Responses to inquiries are posted on-line at http://www.bids.delaware.gov.
3. THE BID PROPOSAL incorporates a cd containing **Expedite**, **version 5.9a** and its installation file. Bidders are to use the cd provided to enter their bid amounts into the Expedite file. The Expedite bid file must be printed and submitted in paper form along with the cd and other required documents prior to the Bid due date and time.
4. SURETY BOND - Each proposal must be accompanied by a deposit of either surety bond or security for a sum equal to at least 10% of the bid.
5. **DRUG TESTING** - Regulation 4104; The state Office of Management and Budget has developed regulations that require Contractors and Subcontractors to implement a program of mandatory drug testing for Employees who work on Large Public Works Contracts funded all or in part with public funds pursuant to 29 **Del.C.** §6908(a)(6). **Refer to the full requirements by following the below link:** http://regulations.delaware.gov/register/september2015/final/19%20DE%20Reg%20207%2009-01-15.htm
   Please note a few of the requirements listed below; for FAQs click here.
   * At bid submission - submit with the bid a signed affidavit certifying that the Contractor has in place or will implement during the entire term of the contract a Mandatory Drug Testing Program for their Employees that complies with this regulation;
   * Upon DBE participation submission - submit a separate signed affidavit from each DBE Subcontractor certifying they have in place or will implement during the entire term of the contract a Mandatory Drug Testing Program for their Employees that complies with this regulation;
   * Two business days prior to contract execution - The awarded Contractor shall provide to DelDOT copies of the Employee Drug Testing Program for the Contractor and each participating DBE firm;
   * Subcontractors - Contractors that employ Subcontractors on the jobsite may do so only after submitting a copy of the Subcontractor's Employee Drug Testing Program along with the standard subcontractor information. A Contractor or Subcontractor shall not commence work until DelDOT has concluded the Employee Drug Testing Program complies with this Regulation as per Section 3.2;
   * Testing Report Forms shall be submitted to DelDOT no less than quarterly (forms will be provided).
   * Penalties for non-compliance are specified in the regulation.

6. Supplemental Specifications to the August 2001 Standard Specifications were issued November 24, 2014 and apply to this project. They can be viewed here. The ***Specifications Note*** document is for the use by the bidders to reference the new numbers to the past numbers used for bidding purposes on previous Department contracts.
7. **PLEASE NOTE** federal requirements for the DBE program under 49CFR §26.53(b)(3)(i)(B) have changed effective November 3, 2014. Submission of DBE participation information is now required from the lowest apparent bidder no later than seven (7) days after bid opening *(formerly 10 days)*.
8. No RETAINAGE will be withheld on this contract.
9. The Department's External Complaint Procedure can be viewed on DelDOT's Website at; http://www.deldot.gov/information/business/, or you may request a copy by calling (302) 760-2555.
10. **BREAKOUT SHEETS** MUST be submitted either with your bid documents; or within seven (7) calendar days following the bid due date by the lowest apparent bidder. Refer to instructions adjacent to the Breakout Sheets in this document.
11. Prospective bidders are advised that there will be a **Pre-Bid Meeting** Wednesday, February 24, 2016 at 2:00 p.m. in the DelDOT Administration Building, 800 Bay Road, Dover, Delaware, 19903.

CONSTRUCTION ITEMS UNITS OF MEASURE

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

*Not used for units of measurement for payment.

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GENERAL NOTICES

SPECIFICATIONS:

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

CLARIFICATIONS:

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

ATTESTING TO NON-COLLUSION:

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

QUANTITIES:

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

EQUALITY OF EMPLOYMENT OPPORTUNITY ON PUBLIC WORKS:

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

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

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

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

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

   3. The contractor will ensure employees receive equal pay for equal work, without regard to sex. Employee pay differential is acceptable if pursuant to a seniority system, a merit system, a system which measures earnings by quantity or quality of production, or if the differential is based on any other factor other than sex.

TAX CLEARANCE:

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

LICENSE:

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

SUBCONTRACTOR LICENSE: 29 DEL. C. §6967:

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

DIFFERING SITE CONDITIONS,

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

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

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

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

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

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

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

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

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

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

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

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

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

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

CONFLICT WITH FEDERAL STATUTES OR REGULATIONS:

Delaware Code, Title 29, Chapter 69, Section 6904, Paragraph (a):

"If any provision of this subchapter conflicts or is inconsistent with any statute, rule or regulation of the federal government applicable to a project or activity, the cost of which is to be paid or reimbursed in whole or in part by the federal government, and due to such conflict or inconsistency the availability of federal funds may be jeopardized, such provision shall not apply to such project or activity."

FEDERAL LABOR AND EMPLOYMENT REQUIREMENTS

Federal Regulation 23 CFR § 635.117(b) Labor and employment, states:

"No procedures or requirement shall be imposed by any State which will operate to discriminate against the employment of labor from any other State, possession or territory of the United States, in the construction of a Federal-aid project."

CONVICT PRODUCED MATERIALS:

(a) Materials produced after July 1, 1991, by convict labor may only be incorporated in a Federal-aid highway construction project if such materials have been:

(1) Produced by convicts who are on parole, supervised release, or probation from a prison or

(2) Produced in a qualified prison facility and the cumulative annual production amount of such materials for use in Federal-aid highway construction does not exceed the amount of such materials produced in such facility for use in Federal-aid highway construction during the 12-month period ending July 1, 1987.

(b) Qualified prison facility means any prison facility in which convicts, during the 12-month period ending July 1, 1987, produced materials for use in Federal-aid highway construction projects.

TO REPORT BID RIGGING ACTIVITIES:

The U. S. Department of Transportation (DOT) operates the below toll-free "hotline" Monday through Friday, 8:00 a.m. to 5:00 p.m. eastern time. Anyone with knowledge of possible bid rigging, bidder collusion, or other fraudulent activities should use the "hotline" to report such activities.

The "hotline" is part of the DOT's continuing effort to identify and investigate highway construction contract fraud and abuse and is operated under the direction of the DOT Inspector General. All information will be treated confidentially and caller anonymity will be respected.

TO REPORT BID RIGGING ACTIVITIES
CALL 1-800-424-9071

NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION
TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY
(EXECUTIVE ORDER 11246)

1. The Offeror's or Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Specifications" set forth herein.

2. The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate work force in each trade on all construction work in the covered area, are as follows:

Goals for Minority Participation In Each Trade	Goals for Female Participation In Each Trade
12.3% (New Castle County) 14.5% (Kent & Sussex Counties)	6.9% (Entire State)

These goals are applicable to all the Contractor's construction work (whether or not it is Federal or federally assisted) performed in the covered area. If the contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the contractor also is subject to the goals for both its federally involved and non-federally involved construction.

The Contractor's compliance with the Executive Order and the Executive Order and the regulations in CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the Executive Order, and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

3. The Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within 10 working days of award of any construction subcontract in excess of $10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address, and telephone number of the subcontractor; employer identification number of the subcontractor; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the subcontract is to be performed.

4. As used in this Notice, and in the contract resulting from this solicitation, the "covered area" is NEW CASTLE County.

REV. 11-3-80

STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY
CONSTRUCTION CONTRACT SPECIFICATIONS (EXECUTIVE ORDER 11246)

1. As used in these specifications:

   a. "Covered area" means the geographical area described in the solicitation from which this contract resulted;
   b. "Director" means Director, Office of Federal Contract Compliance Programs, United States Department of Labor, or any person to whom the Director delegates authority;
   c. "Employer identification number" means the Federal Social Security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941.
   d. "Minority" includes:
      i. Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);
      ii. Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish Culture or origin, regardless of race);
      iii. Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and
      iv. American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).

2. Whenever the Contractor, or any Subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of $10,000 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.

3. If the Contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each Contractor or Subcontractor participating in an approved Plan is individually required to comply with its obligations under the EEO clause, and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other Contractors or Subcontractors toward a goal in an approved plan does not excuse any covered Contractor's or Subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.

4. The Contractor shall implement the specific affirmative action standards provided in paragraphs 7a through 7p of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. Covered Construction contractors performing construction work in geographical areas where they do not have a Federal or federally assisted construction contract shall apply the minority and female goals established for the geographical area where the work is being performed. Goals are published periodically in the Federal Register in notice form, and such notices may be obtained from any Office of Federal Contract Compliance Program Office or from the Federal procurement contracting offices. The Contractor is expected to make substantially uniform progress in meeting its goals in each craft during the period specified.

5. Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the Contractor has a collective bargaining agreement, to refer either minorities or women shall excuse the Contractor's obligations under these specifications, Executive Order 11246, or the regulations promulgated pursuant thereto.

6. In order for the nonworking training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.

7. The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensive as the following:

   a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, will assign two or more women to each construction project. The Contractor shall specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.
   b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.
   c. Maintain a current file of the names, addresses and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with the reason therefor, along with whatever additional actions the Contractor may have taken.
   d. Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.
   e. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under 7b above.
   f. Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.
   g. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination or other employment decisions including specific review of these items with on-site supervisory personnel such as Superintendents, General Foreman, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.
   h. Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the Contractor's EEO policy with other Contractors and Subcontractors with whom the Contractor does or anticipates doing business.
   i. Direct its recruitment efforts, both oral and written, to minority, female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the Contractor shall send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.
   j. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer and vacation employment to minority and female youth both on the site and in other areas of a Contractor's work force.
   k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.

l. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.

m. Ensure that seniority practices, job classifications, work assignments and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the Contractor's obligations under these specifications are being carried out.

n. Ensure that all facilities and company activities are nonsegregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.

o. Document and maintain a record of all solicitations of offers for subcontractors from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

p. Conduct a review, at least annually, of all supervisors' adherence to and performance under the Contractor's EEO policies and affirmative action obligations.

8. Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations (7a through p). The efforts of a contractor association, joint contractor-union, contractor-community, or other similar group of which the Contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under 7a through p of these Specifications provided that the Contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female work force participating, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply, however, is the Contractor's and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.

9. A single goal for minorities and a separate single goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the Contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example, even though the Contractor has achieved its goals for women generally, the Contractor may be in violation of the Executive Order if a specific minority group of women is under utilized).

10. The Contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.

11. The Contractor shall not enter into any Subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.

12. The Contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Order of Federal Contract Compliance Programs. Any Contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.

13. The Contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 7 of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.

14. The Contractor shall designate a responsible official to monitor all employment-related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government, and to keep records. Records shall at least include for each employee the name, address, telephone numbers, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate

of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.

15. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

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TRAINING SPECIAL PROVISIONS

This Training Special Provision supersedes subparagraph 7b of the Special Provision entitled "Specific Equal Employment Opportunity Responsibilities", (Attachment 1), and is in implementation of 23 U.S.C. 140(a). As part of the contractor's equal employment opportunity affirmative action program, training shall be provided as follows:

The contractor shall provide on-the-job training aimed at developing full journeyman in the type of trade or job classification involved.

The number of trainees to be trained under the special provision will be 0. In the event the contractor subcontracts a portion of the contract work, he shall determine how many, if any, of the trainees are to be trained by the subcontractor, provided however, that the contractor shall retain the primary responsibility for meeting the training requirements imposed by this special provision. The contractor shall also insure that this Training Special Provision is made applicable to such subcontract. Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year apprenticeship or training.

The number of trainees shall be distributed among the work classification on the basis of the contractor's needs and the availability of journeymen in the various classifications within a reasonable area of recruitment. Prior to commencing construction, the contractor shall submit to the Department of Highways and Transportation for approval the number of trainees to be trained in each selected classification and training program to be used. Furthermore, the contractor shall specify the starting time for training in each of the classifications. The contractor will be credited for each trainee employed by him on the contract work who is currently enrolled or becomes enrolled in an approved program and will be reimbursed for such trainees as provided hereinafter.

Training and upgrading of minorities and women toward journeyman status is a primary objective of this Training Special Provision. Accordingly, the contractor shall make every effort to enroll minority trainees and women (e.g., by conducting systematic and direct recruitment through public and private sources likely to yield minority and women trainees) to the extent that such persons are available within a reasonable area of recruitment. The contractor will be responsible for demonstrating the steps that he has taken in pursuance thereof, prior to a determination as to whether the contractor is in compliance with this Training Special Provision. This training commitment is not intended, and not be used, to discriminate against any applicant for training, whether a member of a minority group or not.

No employee shall be employed as a trainee in any classification in which he has successfully completed a training course leading to journeyman status or in which he has been employed as a journeyman. The contractor should satisfy this requirement by including appropriate questions in the employee application or by other suitable means. Regardless of the method used the contractor's records should document the findings in each case.

The minimum length and type of training for each classification will be as established in the training program selected by the contractor and approved by the Department of Highways and Transportation and the Federal Highway Administration. The Department of Highways and Transportation and the Federal Highway Administration shall approve a program if it is reasonably calculated to meet the equal employment opportunity obligations of the contractor and to qualify the average trainee for journeyman status in the classification concerned by the end of the training period. Furthermore, apprenticeship programs registered with the U.S. Department of Labor, Bureau of Apprenticeship and Training, or with a State apprenticeship agency recognized by the Bureau and training programs approved but not necessarily sponsored by the U.S. Department of Labor, Manpower Administration, Bureau of Apprenticeship and Training shall also be considered acceptable provided it is being administered in a manner consistent with the equal employment

obligations of Federal-aid highway construction contracts. Approval or acceptance of a training program shall be obtained from the State prior to commencing work the classification covered by the program. It is the intention of these provisions that the training is to be provided in the construction crafts rather than clerk-typists or secretarial-type positions. Training is permissible in lower level management positions such as office engineers, estimators, timekeepers, etc., where the training is oriented toward construction applications. Training in the laborer classification may be permitted provided that significant and meaningful training is provided and approved by the division office. Some off-site training is permissible as long as the training is an integral part of an approved training program and does not comprise a significant part of the overall training.

Except as otherwise noted below, the contractor will be reimbursed 80 cents per hour of training given an employee on this contract in accordance with an approved training program. As approved by the engineer, reimbursement will be made for training persons in excess of the number specified herein. This reimbursement will be made even though the contractor receives additional training program funds from other sources, provided such other sources does not specifically prohibit the contractor from receiving other reimbursement. Reimbursement for off-site training indicated above may only be made to the contractor where he does one or more of the following and the trainees are concurrently employed on a Federal-aid project; contributes to the cost of the training; provides the instruction of the trainee; or pays the trainee's wages during the off-site training period.

No payment shall be made to the contractor if either the failure to provide the required training, or the failure to hire the trainees as a journeyman, is caused by the contractor and evidences a lack of good faith on the part of the contractor in meeting the requirements of this Training Special Provision. It is normally expected that a trainee will begin his training on the project as soon as feasible after start of work utilizing the skill involved and remain on the project as long as training opportunities exist in his work classification or until he has completed his training program. It is not required that all trainees be on board for the entire length of the contract. A contractor will have fulfilled his responsibilities under this Training Special Provision if he has provided acceptable training to the number of trainees specified. The number trained shall be determined on the basis of the total number enrolled on the contract for a significant period.

Trainees will be paid a least 60 percent of the appropriate minimum journeymen's rate specified in the contract for the first half of the of the training period, 75 percent for the third quarter of the training period, and 90 percent for the last quarter of the training period, unless apprentices or trainees is an approved existing program are enrolled as trainees on this project. In fact case, the appropriate rates approved by the Department of Labor or Transportation in connection with the existing program shall apply to all trainees being trained for the same classification who are covered by this Training Special Provisions.

The contractor shall furnish the trainee a copy of the program he will follow in providing the training.

The contractor shall provide each trainee with a certification showing the type and length of training satisfactorily completed.

The contractor will provide for the maintenance of records and furnish periodic reports documenting his performance under this Training Special Provision.

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INTERMODAL SURFACE TRANSPORTATION EFFICIENCY ACT & TRANSPORTATION EQUITY ACT

Recipients of Federal-aid highway funds authorized under Titles I (other than Part B) and V of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), or Titles I, III, and V of the Transportation Equity Act for the 21st Century (TEA-21) are required to comply with the regulations of 49 Code of Federal Regulations (CFR) Part 26 - Participation by Disadvantaged Business Enterprises in Department of Transportation Financial Assistance Programs.

DISADVANTAGED BUSINESS ENTERPRISE (DBE) PROGRAM SPECIFICATION

The U.S. Department of Transportation (DOT) requires that the Delaware Department of Transportation continue the established Disadvantaged Business Enterprise (DBE) Program for participation in U.S. DOT programs and that the program follow the final rules as stated in 49 CFR Part 26 and the Department's approved DBE Program plan.

The following definitions apply to this subpart:

Disadvantaged Business Enterprise or DBE means a for-profit small business concern (1) that is at least 51 percent owned by one or more individuals who are both socially and economically disadvantaged or, in the case of a corporation, in which 51 percent of the stock is owned by one or more such individuals; and, (2) whose management and daily business operations are controlled by one or more of the socially and economically disadvantaged individuals who own it.

DOT-assisted contract means any contract between a recipient and a contractor (at any tier) funded in whole or in part with DOT financial assistance, including letters of credit or loan guarantees, except a contract solely for the purchase of land.

Good Faith Efforts means efforts to achieve a DBE goal or other requirement of this part which, by their scope, intensity, and appropriateness to the objective, can reasonably be expected to fulfill the program requirement.

Joint Venture means an association of a DBE firm and one or more other firms to carry out a single, for-profit business enterprise, for which the parties combine their property, capital, efforts, skills and knowledge, and in which the DBE is responsible for a distinct, clearly defined portion of the work of the contract and whose share in the capital contribution, control, management, risks, and profits of the joint venture are commensurate with its ownership interest.

Race-conscious measure or program is one that is focused specifically on assisting only DBEs, including women-owned DBEs.

Race-neutral measure or program is one that is, or can be, used to assist all small businesses. For the purposes of this part, race-neutral includes gender neutrality.

Small Business concern means, with respect to firms seeking to participate as DBEs in DOT-assisted contracts, a small business concern as defined pursuant to section 3 of the Small Business Act and Small Business Administration regulations implementing it (13 CFR part 121) that also does not exceed the cap on average annual gross receipts specified in 49 CFR §26.65(b).

Socially and economically disadvantaged individuals means any individual who is a citizen (or lawfully admitted permanent resident) of the United States and who is - (1) any individual who a recipient finds to be a socially and economically disadvantaged individual on a case-by-case basis; (2) any individual in the following groups, members of which are rebuttably presumed to be socially and economically disadvantaged:

(i) Black Americans which includes persons having origins in any of the Black racial groups of Africa;
(ii) Hispanic Americans which includes persons of Mexican, Puerto Rican, Cuban, Dominican, Central or South American, or other Spanish or Portuguese culture or origin, regardless of race;
(iii) Native Americans which includes persons who are American Indians, Eskimos, Aluets, or Native Hawaiians;
(iv) Asian-Pacific Americans which includes persons whose origins are from Japan, China, Taiwan, Korea, Burma (Myanmar), Vietnam, Laos, Cambodia (Kampuchea), Thailand, Malaysia, Indonesia, the Philippines, Brunei, Samoa, Guam, the U.S. Trust Territories of the Pacific Islands (Republic of Palau), the Commonwealth of the Northern Marianas Islands, Macao, Fiji, Tonga, Kirbati, Juvalu, Nauru, Federated States of Micronesia, or Hong Kong;
(v) Subcontinent Asian Americans which includes persons whose origins are from India, Pakistan, Bangladesh, Bhutan, the Maldives Islands, Nepal or Sri Lanka;
(vi) Women;
(vii) Any additional groups whose members are designated as socially and economically disadvantaged by the SBA, at such time as the SBA designation becomes effective.

DelDOT will establish specific goals for each particular DOT-assisted project which will be expressed as a percentage of the total dollar amount of contract bid. The specific contract goals for this contract are:

Disadvantaged Business Enterprise 3 % Percent

DelDOT continues to reserve the right to approve DBE subcontractors and all substitutions of DBE subcontractors prior to award and during the time of the contract.

Bidders are required to submit with their bids the completed DBE Program Assurance portion of the Certification document which will state the bidders intent of meeting the goals established for this contract; or in the instance where a contractor cannot meet the assigned DBE Goals for this contract, he/she shall at the time of bid submit documentation required to verify that he/she has made a Good Faith Effort to meet the DBE Goals. Guidance for submitting a Good Faith Effort is identified in the next section and in the DBE Program Plan. Further, the apparent low bidder must submit to DelDOT within seven (7) calendar days after

the bid opening, executed originals of each and every DBE subcontract to satisfy contract goals consistent with the DBE Program Assurance submitted as part of the bid package.

No contract work shall be performed by a DBE subcontractor until the executed DBE subcontract is approved in writing by DelDOT and the Department has issued the required Notice to Proceed. Any DBE subcontract relating to work to be performed pursuant to this contract, which is submitted to DelDOT for approval, must contain all DBE subcontractor information, the requirements contained in this contract, and must be fully executed by the contractor and DBE subcontractor.

Each contract between the prime contractor and each DBE subcontractor shall at the minimum include the 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.

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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. 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 seven (7) calendar days after the bid opening shall create a rebuttable presumption that the bid is not responsive.
4. 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.
5. 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.
6. In the execution of this contract, the successful bidder agrees to comply with the following contract assurance and will include this same language in each subcontractor contract:

"The contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such remedy as the recipient deems appropriate." 49 CFR Section 26.13

7. In addition to this specification, bidders must comply with all provisions of the rules and regulations adopted by the U.S. Department of Transportation for DBE participation in U.S. DOT and DelDOT Programs (49 CFR Part 26) and the Delaware Department of Transportation Disadvantaged Business Enterprise Program Plan; each of which is hereby incorporated and made part of this specification. Bidders are also reminded that they must be responsible and responsive bidders in all other aspects aside from the DBE Program in order to be awarded the contract.
8. In accordance with 49 CFR 26.53(f)(1), DelDOT requires that a prime contractor not terminate a DBE subcontractor without prior written consent from the DelDOT Civil Rights Office. This includes, but is not limited to, instances in which a prime contractor seeks to perform work originally designated for a DBE subcontractor with its own forces or those of an affiliate, a non-DBE firm, or with another DBE firm.

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GUIDANCE FOR GOOD FAITH EFFORT

When the DBE Goals established for a contract by DelDOT are not met, the contractor shall demonstrate good faith efforts to meet the DBE contract goals. The contractor shall demonstrate that the efforts made were those that a contractor actively and aggressively seeking to meet the goals established by DelDOT would make, given all relevant circumstances. Evidence of this good faith effort will be submitted with the bid at the time of the bid opening.

The contractor is expected to demonstrate good faith efforts by actively and aggressively seeking out DBE participation in the project to the maximum extent, given all relevant circumstances. Following are the kinds of efforts that may be taken but are not deemed to be exclusive or exhaustive and DelDOT will consider other factors and types of efforts that may be relevant:

1. Efforts made to select portions of the work proposed to be performed by DBEs in order to increase the likelihood of achieving the stated goal. Selection of portions of work are required to at least equal the goal for DBE utilization specified in this contract.
2. Written notification at least ten (10) calendar days prior to the opening of a bid soliciting DBE interest in participating in the contract as a subcontractor or supplier and for specific items of work.
3. Efforts made to obtain and negotiate with DBE firms for specific items of work:
   a. Description of the means by which firms were solicited (i.e. by telephone, e-mail, written notice, advertisement).
   b. The names, addresses, telephone numbers of DBE's contacted, the dates of initial contact; and whether initial solicitations of interest were followed-up by contacting the DBEs to determine with certainty whether the DBEs were interested.
   c. A description of the information provided to DBE firms regarding the plans, specifications and estimated quantities for portions of the work to be performed.
   d. A statement of why additional agreements with DBE's were not reached in order to meet the projected goal.
   e. Listing of each DBE contacted but not contracted and the reasons for not entering a contract.
4. Efforts made to assist DBEs that need assistance in obtaining bonding, insurance, or lines of credit required by the contractor.
5. Reasons why certified DBEs are not available or not interested.
6. Efforts to effectively use the services of available disadvantaged community organizations; disadvantaged contractor's groups; local, state and federal DBE assistance offices; and other organizations that provide assistance in recruitment and placement of DBEs.

The following are examples of actions that may not be used as justification by the contractor for failure to meet DBE contract goals:

1. Failure to contract with a DBE solely because the DBE was unable to provide performance and/or payment bonds.
2. Rejection of a DBE bid or quotation based on price alone.

3. Rejection of a DBE because of its union or non-union status.
4. Failure to contract with a DBE because the contractor normally would perform all or most of the work in the contract.

Administrative reconsideration:

Within five (5) days of being informed by DelDOT that it is not responsive because it has not documented sufficient good faith efforts, a bidder may request administrative reconsideration. Bidder should make this request in writing to the following reconsideration official: Director of Administration, DelDOT, P. O. Box 778, Dover, Delaware 19903. The reconsideration official will not have played any role in the original determination that the bidder did not document sufficient good faith efforts.

As part of this reconsideration, the bidder will have the opportunity to provide written documentation or argument concerning the issue of whether it met the goal or made adequate good faith efforts to do so. The bidder will have the opportunity to meet in person with the reconsideration official, explaining the basis for finding that the bidder did or did not meet the goal or make adequate good faith efforts to do so. The final decision made by the reconsideration official will be communicated to the bidder in writing. The result of the reconsideration process is not administratively appealable to the U.S. Department of Transportation.

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REQUIRED CONTRACT PROVISIONS - FEDERAL-AID CONSTRUCTION CONTRACTS
(Exclusive of Appalachian Contracts)

FHWA-1273 -- Revised May 1, 2012 http://www.fhwa.dot.gov/programadmin/contracts/1273/1273.docx

I. GENERAL

1. Form FHWA-1273 must be physically incorporated in each construction contract funded under Title 23 (excluding emergency contracts solely intended for debris removal). The contractor (or subcontractor) must insert this form in each subcontract and further require its inclusion in all lower tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services).

   The applicable requirements of Form FHWA-1273 are incorporated by reference for work done under any purchase order, rental agreement or agreement for other services. The prime contractor shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

   Form FHWA-1273 must be included in all Federal-aid design-build contracts, in all subcontracts and in lower tier subcontracts (excluding subcontracts for design services, purchase orders, rental agreements and other agreements for supplies or services). The design-builder shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

   Contracting agencies may reference Form FHWA-1273 in bid proposal or request for proposal documents, however, the Form FHWA-1273 must be physically incorporated (not referenced) in all contracts, subcontracts and lower-tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services related to a construction contract).

2. Subject to the applicability criteria noted in the following sections, these contract provisions shall apply to all work performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract.

3. A breach of any of the stipulations contained in these Required Contract Provisions may be sufficient grounds for withholding of progress payments, withholding of final payment, termination of the contract, suspension / debarment or any other action determined to be appropriate by the contracting agency and FHWA.

4. Selection of Labor: During the performance of this contract, the contractor shall not use convict labor for any purpose within the limits of a construction project on a Federal-aid highway unless it is labor performed by convicts who are on parole, supervised release, or probation. The term Federal-aid highway does not include roadways functionally classified as local roads or rural minor collectors.

II. NONDISCRIMINATION

The provisions of this section related to 23 CFR Part 230 are applicable to all Federal-aid construction contracts and to all related construction subcontracts of $10,000 or more. The provisions of 23 CFR Part 230 are not applicable to material supply, engineering, or architectural service contracts.

In addition, the contractor and all subcontractors must comply with the following policies: Executive Order 11246, 41 CFR 60, 29 CFR 1625-1627, Title 23 USC Section 140, the Rehabilitation Act of 1973, as

amended (29 USC 794), Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The contractor and all subcontractors must comply with: the requirements of the Equal Opportunity Clause in 41 CFR 60-1.4(b) and, for all construction contracts exceeding $10,000, the Standard Federal Equal Employment Opportunity Construction Contract Specifications in 41 CFR 60-4.3.

Note: The U.S. Department of Labor has exclusive authority to determine compliance with Executive Order 11246 and the policies of the Secretary of Labor including 41 CFR 60, and 29 CFR 1625-1627. The contracting agency and the FHWA have the authority and the responsibility to ensure compliance with Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), and Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The following provision is adopted from 23 CFR 230, Appendix A, with appropriate revisions to conform to the U.S. Department of Labor (US DOL) and FHWA requirements.

1. Equal Employment Opportunity: Equal employment opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (28 CFR 35, 29 CFR 1630, 29 CFR 1625-1627, 41 CFR 60 and 49 CFR 27) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140 shall constitute the EEO and specific affirmative action standards for the contractor's project activities under this contract. The provisions of the Americans with Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR 35 and 29 CFR 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:

    a. The contractor will work with the contracting agency and the Federal Government to ensure that it has made every good faith effort to provide equal opportunity with respect to all of its terms and conditions of employment and in their review of activities under the contract.

    b. The contractor will accept as its operating policy the following statement:
    "It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, pre-apprenticeship, and/or on-the-job training."

2. EEO Officer: The contractor will designate and make known to the contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active EEO program and who must be assigned adequate authority and responsibility to do so.

3. Dissemination of Policy: All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:

    a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer.

    b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.

    c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minorities and women.

d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.

e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.

4. Recruitment: When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minorities and women in the area from which the project work force would normally be derived.

   a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minorities and women. To meet this requirement, the contractor will identify sources of potential minority group employees, and establish with such identified sources procedures whereby minority and women applicants may be referred to the contractor for employment consideration.

   b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, the contractor is expected to observe the provisions of that agreement to the extent that the system meets the contractor's compliance with EEO contract provisions. Where implementation of such an agreement has the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Federal nondiscrimination provisions.

   c. The contractor will encourage its present employees to refer minorities and women as applicants for employment. Information and procedures with regard to referring such applicants will be discussed with employees.

5. Personnel Actions: Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, national origin, age or disability. The following procedures shall be followed:

   a. The contractor will conduct periodic inspections of project sites to insure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.
   b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.

   c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.

   d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with its obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of their avenues of appeal.

6. Training and Promotion:

   a. The contractor will assist in locating, qualifying, and increasing the skills of minorities and women who are applicants for employment or current employees. Such efforts should be aimed at developing full journey level status employees in the type of trade or job classification involved.

   b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision. The contracting agency may reserve training positions for persons who receive welfare assistance in accordance with 23 U.S.C. 140(a).

c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.

d. The contractor will periodically review the training and promotion potential of employees who are minorities and women and will encourage eligible employees to apply for such training and promotion.

7. Unions: If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use good faith efforts to obtain the cooperation of such unions to increase opportunities for minorities and women. Actions by the contractor, either directly or through a contractor's association acting as agent, will include the procedures set forth below:

   a. The contractor will use good faith efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minorities and women for membership in the unions and increasing the skills of minorities and women so that they may qualify for higher paying employment.

   b. The contractor will use good faith efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, national origin, age or disability.

   c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the contracting agency and shall set forth what efforts have been made to obtain such information.

   d. In the event the union is unable to provide the contractor with a reasonable flow of referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, national origin, age or disability; making full efforts to obtain qualified and/or qualifiable minorities and women. The failure of a union to provide sufficient referrals (even though it is obligated to provide exclusive referrals under the terms of a collective bargaining agreement) does not relieve the contractor from the requirements of this paragraph. In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the contracting agency.

8. Reasonable Accommodation for Applicants / Employees with Disabilities: The contractor must be familiar with the requirements for and comply with the Americans with Disabilities Act and all rules and regulations established there under. Employers must provide reasonable accommodation in all employment activities unless to do so would cause an undue hardship.

9. Selection of Subcontractors, Procurement of Materials and Leasing of Equipment: The contractor shall not discriminate on the grounds of race, color, religion, sex, national origin, age or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment. The contractor shall take all necessary and reasonable steps to ensure nondiscrimination in the administration of this contract.

   a. The contractor shall notify all potential subcontractors and suppliers and lessors of their EEO obligations under this contract.

   b. The contractor will use good faith efforts to ensure subcontractor compliance with their EEO obligations.

10. Assurance Required by 49 CFR 26.13(b):

    a. The requirements of 49 CFR Part 26 and the State DOT's U.S. DOT-approved DBE program are incorporated by reference.

    b. The contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the contracting agency deems appropriate.

11. Records and Reports: The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following the date of the final payment to the contractor for all contract work and shall be available at reasonable times and places for inspection by authorized representatives of the contracting agency and the FHWA.

    a. The records kept by the contractor shall document the following:

        (1) The number and work hours of minority and non-minority group members and women employed in each work classification on the project;

        (2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women; and

        (3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minorities and women;

    b. The contractors and subcontractors will submit an annual report to the contracting agency each July for the duration of the project, indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on Form FHWA-1391. The staffing data should represent the project work force on board in all or any part of the last payroll period preceding the end of July. If on-the-job training is being required by special provision, the contractor will be required to collect and report training data. The employment data should reflect the work force on board during all or any part of the last payroll period preceding the end of July.

III. NONSEGREGATED FACILITIES

This provision is applicable to all Federal-aid construction contracts and to all related construction subcontracts of $10,000 or more.

The contractor must ensure that facilities provided for employees are provided in such a manner that segregation on the basis of race, color, religion, sex, or national origin cannot result. The contractor may neither require such segregated use by written or oral policies nor tolerate such use by employee custom. The contractor's obligation extends further to ensure that its employees are not assigned to perform their services at any location, under the contractor's control, where the facilities are segregated. The term "facilities" includes waiting rooms, work areas, restaurants and other eating areas, time clocks, restrooms, washrooms, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing provided for employees. The contractor shall provide separate or single-user restrooms and necessary dressing or sleeping areas to assure privacy between sexes.

IV. DAVIS-BACON AND RELATED ACT PROVISIONS

This section is applicable to all Federal-aid construction projects exceeding $2,000 and to all related subcontracts and lower-tier subcontracts (regardless of subcontract size). The requirements apply to all projects located within the right-of-way of a roadway that is functionally classified as Federal-aid highway. This excludes roadways functionally classified as local roads or rural minor collectors, which are exempt. Contracting agencies may elect to apply these requirements to other projects.

The following provisions are from the U.S. Department of Labor regulations in 29 CFR 5.5 “Contract provisions and related matters” with minor revisions to conform to the FHWA-1273 format and FHWA program requirements.

1. Minimum wages

    a. All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph 1.d. of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph 1.b. of this section) and the Davis-Bacon poster (WH–1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

b. (1) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(i) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(ii) The classification is utilized in the area by the construction industry; and

(iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(2) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(3) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. The Wage and Hour Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(4) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs 1.b.(2) or 1.b.(3) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

c. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

d. If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

2. Withholding

The contracting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract, or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the contracting agency may, after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

3. Payrolls and basic records

a. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

b. (1) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the contracting agency. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g. , the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH–347 is available for this purpose from the Wage and Hour Division Web site at http://www.dol.gov/esa/whd/forms/wh347instr.htm or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the contracting agency for transmission to the State DOT, the FHWA or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the contracting agency..

(2) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(i) That the payroll for the payroll period contains the information required to be provided under §5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under §5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(ii) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without

rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(3) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH–347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 3.b.(2) of this section.

(4) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

c. The contractor or subcontractor shall make the records required under paragraph 3.a. of this section available for inspection, copying, or transcription by authorized representatives of the contracting agency, the State DOT, the FHWA, or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the FHWA may, after written notice to the contractor, the contracting agency or the State DOT, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

4. Apprentices and trainees

a. Apprentices (programs of the USDOL).

Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice.

The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.

Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.

In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program,

the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

b. Trainees (programs of the USDOL).

Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration.

The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration.

Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.

In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

c. Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

d. Apprentices and Trainees (programs of the U.S. DOT).
Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeymen shall not be greater than permitted by the terms of the particular program.

5. Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

6. Subcontracts. The contractor or subcontractor shall insert Form FHWA-1273 in any subcontracts and also require the subcontractors to include Form FHWA-1273 in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

7. Contract termination: debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

9. Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in

accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. Certification of eligibility.

    a. By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

    b. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

    c. The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

V. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

The following clauses apply to any Federal-aid construction contract in an amount in excess of $100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by 29 CFR 5.5(a) or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

1. Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

2. Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (1.) of this section, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1.) of this section, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1.) of this section.

3. Withholding for unpaid wages and liquidated damages. The FHWA or the contacting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2.) of this section.

4. Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (1.) through (4.) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1.) through (4.) of this section.

VI. SUBLETTING OR ASSIGNING THE CONTRACT

This provision is applicable to all Federal-aid construction contracts on the National Highway System.

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the contracting agency. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total

original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635.116).

a. The term “perform work with its own organization” refers to workers employed or leased by the prime contractor, and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor or lower tier subcontractor, agents of the prime contractor, or any other assignees. The term may include payments for the costs of hiring leased employees from an employee leasing firm meeting all relevant Federal and State regulatory requirements. Leased employees may only be included in this term if the prime contractor meets all of the following conditions:

   (1) the prime contractor maintains control over the supervision of the day-to-day activities of the leased employees;

   (2) the prime contractor remains responsible for the quality of the work of the leased employees;

   (3) the prime contractor retains all power to accept or exclude individual employees from work on the project; and

   (4) the prime contractor remains ultimately responsible for the payment of predetermined minimum wages, the submission of payrolls, statements of compliance and all other Federal regulatory requirements.

b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid or propose on the contract as a whole and in general are to be limited to minor components of the overall contract.

2. The contract amount upon which the requirements set forth in paragraph (1) of Section VI is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.

3. The contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the contracting officer determines is necessary to assure the performance of the contract.

4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the contracting agency has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract.

5. The 30% self-performance requirement of paragraph (1) is not applicable to design-build contracts; however, contracting agencies may establish their own self-performance requirements.

VII. SAFETY: ACCIDENT PREVENTION

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract.

2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are

unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704).

3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C.3704).

VIII. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, Form FHWA-1022 shall be posted on each Federal-aid highway project (23 CFR 635) in one or more places where it is readily available to all persons concerned with the project:

18 U.S.C. 1020 reads as follows:

"Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 1, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined under this title or imprisoned not more than 5 years or both."

IX. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

By submission of this bid/proposal or the execution of this contract, or subcontract, as appropriate, the bidder, proposer, Federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any person who is or will be utilized in the performance of this contract is not prohibited from receiving an award due to a violation of Section 508 of the Clean Water Act or Section 306 of the Clean Air Act.
2. That the contractor agrees to include or cause to be included the requirements of paragraph (1) of this Section X in every subcontract, and further agrees to take such action as the contracting agency may direct as a means of enforcing such requirements.

X. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

This provision is applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, consultant contracts or any other covered transaction requiring FHWA approval or that is estimated to cost $25,000 or more – as defined in 2 CFR Parts 180 and 1200.

1. **Instructions for Certification – First Tier Participants:**

   a. By signing and submitting this proposal, the prospective first tier participant is providing the certification set out below.

   b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective first tier participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective first tier participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.

   c. The certification in this clause is a material representation of fact upon which reliance was placed when the contracting agency determined to enter into this transaction. If it is later determined that the prospective participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the contracting agency may terminate this transaction for cause of default.

   d. The prospective first tier participant shall provide immediate written notice to the contracting agency to whom this proposal is submitted if any time the prospective first tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

   e. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. “First Tier Covered Transactions” refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contract). “Lower Tier Covered Transactions” refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). “First Tier Participant” refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). “Lower Tier Participant” refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

   f. The prospective first tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.

   g. The prospective first tier participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transactions," provided by the department or contracting agency, entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the $25,000 threshold.

   h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (https://www.epls.gov/), which is compiled by the General Services Administration.

i. Nothing contained in the foregoing shall be construed to require the establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of the prospective participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

j. Except for transactions authorized under paragraph (f) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

* * * * *

2. **Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – First Tier Participants**:

a. The prospective first tier participant certifies to the best of its knowledge and belief, that it and its principals:

(1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency;

(2) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(3) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (a)(2) of this certification; and

(4) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

b. Where the prospective participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

2. Instructions for Certification - Lower Tier Participants:

(Applicable to all subcontracts, purchase orders and other lower tier transactions requiring prior FHWA approval or estimated to cost $25,000 or more - 2 CFR Parts 180 and 1200)

a. By signing and submitting this proposal, the prospective lower tier is providing the certification set out below.

b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department, or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances.

d. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations. “First Tier Covered Transactions” refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contract). “Lower Tier Covered Transactions” refers to any covered transaction under a First Tier Covered Transaction

(such as subcontracts). “First Tier Participant” refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). “Lower Tier Participant” refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.

f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the $25,000 threshold.

g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (https://www.epls.gov/), which is compiled by the General Services Administration.

h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

* * * * *

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Participants:

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency.

2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

* * * * *

XI. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts which exceed $100,000 (49 CFR 20).

1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

   a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.
3. The prospective participant also agrees by submitting its bid or proposal that the participant shall require that the language of this certification be included in all lower tier subcontracts, which exceed $100,000 and that all such recipients shall certify and disclose accordingly.

* * * * *

APPENDICES TO THE TITLE VI ASSURANCE

APPENDIX A

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "contractor") agrees as follows:

1. Compliance with Regulations: The contractor (hereinafter includes consultants) will comply with the Acts and the Regulations relative to Non-discrimination in Federally-assisted programs of the U.S. Department of Transportation, (Federal Highway Administration (FHWA), or Federal Transit Authority (FTA), as they may be amended from time to time, which are herein incorporated by reference and made a part of this contract.
2. Non-discrimination: The contractor, with regard to the work performed by it during the contract, will not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor will not participate directly or indirectly in the discrimination prohibited by the Acts and the Regulations, including employment practices when the contract covers any activity, project, or program set forth in Appendix B of 49 CFR Part 21.
3. Solicitations for Subcontracts, Including Procurements of Materials and Equipment: In all solicitations, either by competitive bidding, or negotiation made by the contractor for work to be performed under a subcontract, including procurements of materials, or leases of equipment, each potential subcontractor or supplier will be notified by the contractor of the contractor's obligations under this contract and the Acts and the Regulations relative to Non-discrimination on the grounds of race, color, or national origin.
4. Information and Reports: The contractor will provide all information and reports required by the Acts and the Regulations, and will permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the Recipient or the Federal Highway Administration (FHWA), or Federal Transit Authority (FTA) to be pertinent to ascertain compliance with such Acts, Regulations, and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish the information, the contractor will so certify to the Recipient or the Federal Highway Administration (FHWA), or Federal Transit Authority (FTA), as appropriate, and will set forth what efforts ithas made to obtain the information.
5. Sanctions for Noncompliance: In the event of a contractor's noncompliance with the Non-discrimination provisions of this contract, the Recipient will impose such contract sanctions as it or the Federal Highway Administration (FHWA), or Federal Transit Authority (FTA) may determine to be appropriate, including, but not limited to:
   withholding payments to the contractor under the contract until the contractor complies;
   and/or cancelling, terminating, or suspending a contract, in whole or in part.
6. Incorporation of Provisions: The contractor will include the provisions of paragraphs one through five in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts and the Regulations . The contractor will take action with respect to any subcontract or procurement as the Recipient or the Federal Highway Administration (FHWA), or Federal Transit Authority (FTA) may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, that if the contractor becomes involved in, or is threatened with litigation by a subcontractor, or supplier because of such direction, the contractor may request the Recipient to enter into any litigation to protect the

interests of the Recipient. In addition, the contractor may request the United States to enter into the litigation to protect the interests of the United States.

APPENDIX E

During the performance of this contract, the contractor or consultant, for itself, its assignees, and successors in interest (hereinafter referred to as the "contractor") agrees to comply with the following nondiscrimination statutes and authorities; including but not limited to:

Pertinent Non-Discrimination Authorities:

Title VI of the Civil Rights Act of 1964 (42 U.S.C. $ 2000d et seq., 78 stat. 252), (prohibits discrimination on the basis of race, color, national origin); and 49 CFR Part 21.

The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970,(42 U.S.C. $ 460 I), (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-aid programs and projects);

Federal-Aid Highway Act of 1973, (23 U.S.C. $ 324 et seq.), (prohibits discrimination on the basis of sex);

Section 504 of the Rehabilitation Act of 1973, (29 U.S.C. $ 794 et seq.), as amended, (prohibits discrimination on the basis of disability); and 49 CFR Part27;

The Age Discrimination Act of 1975, as amended, (42 U.S.C. $ 6101 et seq.), (prohibits discrimination on the basis of age);

Airport and Airway Improvement Act of 1982,(49 USC $471, Section 47123), as amended, (prohibits discrimination based on race, creed, color, national origin, or sex);

The Civil Rights Restoration Act of 1987,(PL 100-209), (Broadened the scope, coverage and applicability of Title VI of the Civil Rights Act of l964,The AgeDiscrimination Act of 1975and Section 504 of the Rehabilitation Act of l973,by expanding the defrnition of the terms "programs or activities" to include all of the programs or activities of the Federal-aid recipients, sub-recipients and contractors, whether such programs or activities are Federally funded or not);

Titles II and III of the Americans with Disabilities Act, which prohibit discrimination on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities (42 U.S.C. $$ 12131 - 12189) as implemented by Department of Transportation regulations at 49 C.F.R. parts 37 and 38;

The Federal Aviation Administration's Non-discrimination statute (49 U.S.C. S 41123) (prohibits discrimination on the basis of race, color, national origin, and sex);

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, which ensures nondiscrimination against minority populations by discouraging programs; policies, and activities with disproportionately high and adverse human health or environmental effects on minority and low-income populations;

Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency, and resulting agency guidance, national origin discrimination includes discrimination because of limited English proficiency (LEP). To ensure compliance with Title VI, you must take reasonable steps to ensure that LEP persons have meaningful access to your programs (70 Fed. Reg. at 74087 to 74100);

Title IX of the Education Amendments of 1972, as amended, which prohibits you from discriminating because of sex in education programs or activities (20 U.S.C. 1681 et seq).

PREVAILING WAGES

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

REQUIREMENT BY DEPARTMENT OF LABOR FOR SWORN PAYROLL INFORMATION

Title 29 Del.C. §6960 stipulates;

> (b) Every contract based upon these specifications shall contain a stipulation that the employer shall pay all mechanics and laborers employed directly upon the site of the work, unconditionally and not less often than once a week and without subsequent deduction or rebate on any account, the full amounts accrued at time of payment, computed at wage rates not less than those stated in the specifications, regardless of any contractual relationship which may be alleged to exist between the employer and such laborers and mechanics. The specifications shall further stipulate that the scale of wages to be paid shall be posted by the employer in a prominent and easily accessible place at the site of the work, and that there may be withheld from the employer so much of accrued payments as may be considered necessary by the Department of Labor to pay to laborers and mechanics employed by the employer the difference between the rates of wages required by the contract to be paid laborers and mechanics on the work and rates of wages received by such laborers and mechanics to be remitted to the Department of Labor for distribution upon resolution of any claims.
>
> (c) Every contract based upon these specifications shall contain a stipulation that sworn payroll information, as required by the Department of Labor, be furnished weekly. The Department of Labor shall keep and maintain the sworn payroll information for a period of 6 months from the last day of the work week covered by the payroll.

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

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

PREVAILING WAGE REQUIREMENTS

It is DelDOT's understanding that the Davis-Bacon Act is not a preemptive statute in the broad sense, and does not preempt or displace State of Delaware prevailing wage requirements.

When a contract for a project contains both Federal Davis-Bacon and State of Delaware prevailing wage standards because of concurrent Federal and State coverage, the employer's minimum wage obligations are determined by whichever standards are higher.

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

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

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

PREVAILING WAGES FOR **HIGHWAY CONSTRUCTION**
EFFECTIVE MARCH 13, 2015 - AMENDED JULY 15, 2015

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

CERTIFIED : 12/17/15 BY: _____
ADMINISTRATOR, OFFICE OF LABOR LAW ENFORCEMENT

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

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

NON- REGISTERED APPRENTICES MUST BE PAID THE MECHANICS RATE.

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

Re: Contract # T201330009.01, Industrial Track Greenway Phase III, New Castle County, DE

GENERAL DECISION: DE160011 01/08/2016 DE11

Superceded General Decision Number: DE20150011

State: DELAWARE

Construction Type: HIGHWAY

COUNTY: New Castle County in Delaware

HIGHWAY CONSTRUCTION PROJECTS

Note: Under Executive Order (EO) 13658, an hourly minimum wage of $10.15 for calendar year 2016 applies to all contracts subject to the Davis-Bacon Act for which the solicitation was issued on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least $10.15 (or the applicable wage rates listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2016. The EO minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/08/2016

SUDE2015-002 04/23/2015

	Rates	Fringes
Bricklayer	49.39	
Carpenter	42.55	
Cement Mason/Concrete Finisher	31.06	
ELECTRICIAN		
Electrician	63.60	
Line Worker	22.50	
Ironworker	42.20	
Laborer	31.10	
Millwright	16.11	
Painter	63.14	
Power Equipment Operator:		
Piledriver	66.42	
Power Equipment Operator	39.15	
Sheet Metal Worker	22.75	
Truck Driver	32.31	

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29 CFR 5.5(a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under an "SU" identifier indicated that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U. S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

4.) All decisions by the Administrative Review Board are final.

END OF GENERAL DECISION

APPLICABILITY OF DAVIS-BACON LABOR STANDARD PROVISIONS TO FLAGGERS

The U.S. Department of Labor has established that the duties of flaggers working on contracts covered by the Davis-Bacon Act, are manual and physical in nature. Accordingly, all employees performing the work of flaggers on Davis-Bacon covered contracts shall be entitled to receive applicable prevailing wage rates.

* * * * *

ALL AGENCY MEMORANDUM NO. 130
U.S. DEPARTMENT OF LABOR
EMPLOYMENT STANDARDS ADMINISTRATION
WAGE AND HOUR DIVISION
WASHINGTON, DC 20210

GUIDELINES

HIGHWAY CONSTRUCTION

Highway projects include the construction, alteration, or repair of roads, streets, highways, runways, taxiways, alleys, trails, paths, parking areas, and other similar projects not incidental to building or heavy construction.

EXAMPLES: Alleys, Base Courses, Bituminous treatments, Bridle Paths, Concrete pavement, Curbs, Excavation and embankment (for road construction), Fencing (highway), Grade crossing elimination (overpasses and underpasses), Guard rails on highway, Highway signs, Highway bridges (overpasses, underpasses, grade separation), Medians, Parking lots, Parkways, Resurfacing streets and highways, Roadbeds, Roadways, Runways, Shoulders, Stabilizing courses, Storm sewers incidental to road construction, Street paving, Surface courses, Taxiways, and Trails.

ANY QUESTIONS REGARDING THE APPLICATION OF THE GUIDELINES ABOVE TO A PARTICULAR PROJECT OR ANY DISPUTES REGARDING THE APPLICATION OF THE WAGE SCHEDULES ARE TO BE REFERRED TO THE WAGE AND HOUR DIVISION, U.S. DEPARTMENT OF LABOR FOR RESOLUTION, AND THE INSTRUCTIONS OF THE WAGE AND HOUR DIVISION ARE TO BE OBSERVED IN ALL INSTANCES.

* ALL AGENCY MEMORANDUM NO. 130
U.S. DEPARTMENT OF LABOR
EMPLOYMENT STANDARDS ADMINISTRATION
WAGE AND HOUR DIVISION
WASHINGTON, DC 20210

SUPPLEMENTAL SPECIFICATIONS
TO THE
AUGUST 2001
STANDARD SPECIFICATIONS

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

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

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

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

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

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

SPECIAL PROVISIONS

CONSTRUCTION ITEM NUMBERS

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

Standard Item Number:

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

Special Provisions Item Number:

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

Examples

Standard Item Number - 202000 Excavation and Embankment

202 Indicates Section Number

000 Indicates Sequential Number

Special Provision Item Number - 202500 Grading and Reshaping Roadway

202 Indicates Section Number

500 Indicates Sequential Number

NOTE:

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

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

401502 - ASPHALT CEMENT COST ADJUSTMENT

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

The Delaware Posted Asphalt Cement Price will be issued monthly by the Department and will be the industry posted price for Asphalt Cement, F.O.B. Philadelphia, Pennsylvania. The link for the posting is http://www.deldot.gov/information/business/bids/asphalt_cement_english.shtml.

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

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

Actual quantity of asphalt cement qualifying for any Asphalt Cement Cost Adjustment will be computed using the weight of eligible asphalt that is shown on the QA/QC pay sheets as a percentage for the delivered material.

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

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

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

The Asphalt cement cost adjustment will be calculated on grade PG 64-22 asphalt regardless of the actual grade of asphalt used. The Project Asphalt Cement Base Price per ton for the project will be the Delaware Posted Asphalt Cement Price in effect on the date of project advertisement.

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

NOTE:

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

5/05/15

202507 - WETLAND ACCESS ROAD TYPE I, DREDGING
202508 - WETLAND ACCESS ROAD, TYPE II

Description:

Wetland Access will include furnishing and placing all materials, all labor, equipment, and incidental construction required to create access for construction in designated wetland areas. The anticipated types of access would be one or a combination of the following:

1. Dredged Canal; (Type I)

2. Temporary Access Roads (to include wooden mats if necessary); (Type II)

All work must be in accordance with applicable permits.

The Corps of Engineers Wetland permit has approved the access methods shown on the plans for over wetlands.

Materials:

All materials shall conform to the requirements shown on the plans for the various sites involving Wetland Access.

Access Methods:

Dredged Canal Sites (Type I Wetland Access) -

This work shall include dredging of existing material, disposing of the material at designated sites, constructing a riprap dike, furnishing and backfilling with fine aggregate, furnishing and placing necessary slope stabilization mats, furnishing, placing and maintaining an "oil boom" to contain any potential fuel spillage, using turbidity curtains, furnishing and installing sheet pile bulkheads, removing the bulkheads after their use is no longer needed, constructing temporary stone access roads to the bulkhead, and restoration of the site. All materials, labor, and equipment necessary to perform the work are included in the item.

The marsh areas will be excavated to a depth approximately three feet below mean low water to facilitate passage of a crane barge or a flex-a-float system, within the limits shown on the Plans. Dredging and continuing maintenance of the canals to necessary depths to float the bridge construction equipment will be the responsibility of the contractor with costs to be included in the lump sum bid price at each designated location. In no case shall the depth of the dredging exceed the depth shown on the Plans. No excavation, dredging, jetting or backfilling will be permitted within the 100-year Flood Plain during the period from March 1 to June 15, inclusive. The Contractor shall schedule the access and bridge foundation construction accordingly. Cost to furnish barges or other necessary floatation devices will be included in the price bid per location for Wetland Access, Type I.

The Contractor shall be responsible for furnishing a dredging method plan, including plans for the disposal of the dredged materials, which shall be approved by the Engineer prior to the start of any operation related to the dredging. The Contractor shall allow a minimum of fourteen calendar days for comments from the Engineer on the dredging method plan.

Any methods of disposing of the dredged material which result in the deposit of dredged materials in areas other than the approved location (i.e. leaks in discharge pipelines, etc.) shall result in the suspension of the dredging operations. The dredged materials deposited outside the approved location shall be removed and properly disposed of and the disposal method corrected to the satisfaction of the Engineer prior to resuming any dredging operations.

A sheet pile bulkhead will be required to facilitate equipment transfer from land to barges. Required construction of the access road over the sewer line is as shown on the Plans.

Restoration of the excavated/dredged ares will include constructing a riprap dike and backfilling to approximate existing ground within the limits as shown on the Plans. The fine aggregate used for backfilling the dredged areas shall meet the requirements of Section 804 and shall be furnished by the Contractor from a source outside the project limits. Materials from any excavation work for the project shall not be used to backfill the dredged areas unless approved by the Engineer. Furnishing and placing the fine aggregate as backfill for the dredged areas shall be included in the item.

Temporary Access Roads (Type II Wetland Access) -

This work shall consist of furnishing and installing necessary diversion dikes, rip-rap, stone, geotextile fabric, polyethylene sheeting, & wooden mats for temporary access roads located in wetlands. Clearing of trees in wetland access areas is also to be included in this item. All labor and equipment necessary to perform the work will be included as well.

Sequencing of the access road construction is to be as follows unless otherwise noted on the Plans or as directed by the Engineer:

1. Clear only the trees directly in conflict with the temporary access road. These trees shall be flagged prior to beginning the clearing operation. During tree removal, the contractor will not be allowed to enter wetlands with earth moving equipment. All felled trees shall be removed by use of a winch or other similar equipment. Trees shall be cut as close to the existing ground as possible. No stump removal will be necessary. This requirement applies only to those trees in conflict with the temporary access roads.

2. Where shown on the Plans, construct Stabilized Construction Entrances (SCE). The SCE shall be maintained per the project's Erosion and Sediment Control Notes.

3. Construct all stone diversion dikes shown on the wetland access drawings including polyethylene sheeting. The sheeting is to be overlapped in a manner that the upstream portion covers the downstream portion with at least an 18" (450 mm) overlap. The dikes must remain in place until all restoration is satisfactorily completed and the Engineer approves their removal.

4. Install silt fence or reinforced silt fence on either side of proposed access roads to prevent any contamination from the access road from entering the wetlands. The fence shall conform to the DelDOT Standard Details.

5. Install Geotextile fabric on existing ground.

6. Install R-4 rip rap, 6" (150 mm) Del. Number 1 Stone and Del. Number 57 Stone surfacing.

7. Install wooden mats if necessary to support proposed equipment.

8. After the roadway is no longer needed, carefully remove and dispose of all materials including geotextile.

9. Restore wetland areas disturbed during construction to their preconstruction conditions, maintaining silt fence until the ground is stabilized.

10. Remove silt fence.

11. Remove stone diversion dikes after all abutment and adjacent fill slopes are completed and stabilized.

12. When Stabilized Construction Entrances are no longer needed, remove and dispose of all materials. Restore all disturbed areas to their preconstruction conditions, maintaining silt fence until ground is stabilized.

The total thickness of R-4 rip rap and the need for matting will be at the discretion of the contractor based on the type of equipment he proposes to use. Stability of the access roads is also the responsibility of the contractor and any failures and/or resulting equipment damage will be the sole and complete responsibility of the contractor.

Continual maintenance of the access roads by the contractor during the construction of the bridges will be incidental to this item. No construction equipment utilized to construct the temporary access roads will be permitted to traverse outside the limits established by the stone diversionary dikes or silt fence.

Method of Measurement:

The item will be paid on a lump sum basis per location and type of wetland access as shown on the Plans. No separate measurement will be made.

Basis of Payment:

Wetland Access, Type I will be paid at the Lump Sum price bid per designated location which price shall be full compensation for furnishing all materials, labor, tools, equipment, and incidentals necessary to construct dredged canals for the purpose of accessing wetlands with construction equipment to construct Bridge foundations, piles, piers, and to erect structural beams. Payment includes dredging, disposal of dredge spoils; construction of riprap dike; furnishing and installing fine aggregate backfill, sheet pile bulkhead installation and removal, slope stabilization mats, "oil boom" placement and maintenance for containing potential fuel spills, turbidity curtains, maintenance of the canal, restoration, and all incidentals necessary to complete the access operations. The cost of floatation devices to support cranes or other conventional bridge construction equipment is also to be included in this item. The cost of installing and maintaining access roads to bulkheads at the proposed canals including, geotextile fabric, R-4 riprap, Del. Number 1 Stone, Del. Number 57 stone, clearing of necessary trees, wooden mats as necessary, and the proper removal of all materials and restoration of the wetland site to original conditions at the conclusion of the work.

Wetland Access, Type II will be paid at the lump sum price bid per designated location which price shall be full compensation for furnishing all materials, labor, tools, equipment, and incidentals necessary to construct and maintain temporary roads. Payment includes furnishing, installation and maintenance of stone diversionary dikes including polyethylene sheeting, geotextile fabric, R-4 rip-rap, Del. Number 1 Stone, Del. Number 57 Stone, clearing of necessary trees, wooden mats as necessary, and the proper removal of all materials and restoration of the wetland site to original conditions at the conclusion of the work.

Silt fence will be paid for under Item 905001. Super silt fence will be paid for under Item 905500.

The Contractor is required to submit, as part of the bid proposal, his estimated breakdown of all quantities involved, and the dollar value assigned to these respective quantities, for each lump sum wetland access, Type I and Type II, bid per location. Failure of the contractor to include any necessary quantities or work item in his breakdown will not relieve the contractor of his responsibility to perform all work required by these specifications. No additional compensation will be considered as a result of the contractor's failure to include any necessary items in his breakdown or his failure to accurately estimate the quantities required to perform the work required by these specifications.

The Contractor may submit to the Engineer after the contract has been awarded a Value Engineering Proposal(s) (VEP) for modifying the wetland access for construction of structures in designated wetland areas as per section 104.12 of the Standard Specifications. All plan and specifications changes or other requirements of the contract for the purpose of reducing the cost of construction will require written approval by the Corps of Engineers. No consideration will be given for delays or additional compensation as a result of processing the VEP to the Corps of Engineers or for the rejection of the VEP. The Contractor is required to prepare the bid proposal as per the wetland access, Type I and Type II described by this specifications.

11/24/15

202560 - CONTAMINATED MATERIAL

Description:

Contaminated Material is defined as solids or liquids (including soil) potentially contaminated with a hazardous substance, requiring special handling and/or disposal per state or federal regulation.

This work describes the excavation, removal and treatment/disposal of contaminated materials resulting from project construction including utility and other types of excavation activities in accordance with the locations and notes on the Plans, and as directed by the Engineer or the Department's environmental representative. The Contractor will be notified of the Department's environmental representative at the pre-construction meeting.

Overview of Costs:

Potential contaminated solids may affect contractor's costs as follows;
Additional cost to normal excavation requirements:
-Cost of 8 mil plastic for placement under and over solid contaminated material,
-Maintaining the segregated contaminated solids staging area.
Reduced cost to normal excavation requirements:
-Not required to, or charged for, transport of contaminated material from site.
-Not required to, or charged for, disposal of contaminated soil.

Potential contaminated liquids will affect contractor’s cost as follows;
Additional cost to normal excavation requirements:
-None
Reduced cost to normal excavation requirements:
-None

Construction Methods and Responsibilities:

Contractor's Responsibilities for potential contaminated solids:

The Contractor shall be responsible for providing the appropriate equipment and personnel necessary to excavate, stage, and load contaminated material for off-site disposal, as identified from previous site environmental investigations or identified during construction activities. The work will be performed in accordance with the procedures described in the site specific "Contaminated Material and Water Removal Work Plan" prepared by the Department's environmental representative. The Department will provide a copy of this plan after the project is awarded and before any work begins. The Contractor shall adhere to applicable Occupational Safety and Health standards, Guidelines and/or Laws. This will include compliance with 29 CFR Part 1910.

After award of the Contract, the Contractor shall immediately be responsible for notifying the Department's HAZMAT Program Mananger’s office (760-2463) for scheduling coordination with the environmental representative. The contractor shall submit a proposed schedule of work to the Department for review and approval prior to any commencement of work on this site. The Contractor is required to perform to a high standard of workmanship to assure protection of workers, local water supplies, and the environment. The Contractor shall coordinate with the utility companies prior to excavation. The Department's environmental representative shall be present during all phases of work associated with the excavation and removal of potentially contaminated material. Payment will not be made for any work done when a Department approved Inspector or environmental representative is not present to provide environmental oversight.

Specific tasks to be performed by the Contractor will include excavating soil per the project specifications. The Contractor will segregate "contaminated" soil as designated by the Department or their environmental representative, from "clean" soil and place the "contaminated" soil in a designated on-site staging area constructed by the Contractor. At a minimum the staging area needs to be lined with 8-mil plastic and a berm constructed to minimize storm water run-off. The "contaminated" soil will need to be covered by the Contractor at the end of each work day. The Contractor will be responsible for loading contaminated soil

onto trucks arranged by the Department's environmental representative on the days the contaminated soil is shipped off-site to a licensed disposal/treatment facility. The Contractor will backfill and compact the excavated area(s) according to the project specifications and payment will be made under that item of the Contract.

Department's Responsibilities:

The Department is responsible for providing and paying; the environmental representative; the transportation of contaminated material for disposal; and the disposal of contaminated material.

The "Contaminated Material and Water Removal Work Plan" will identify; the procedures to be used to excavate and stage the contaminated material; the licensed treatment/disposal facility where the Department will ship the contaminated material; the method the material will be transported to the treatment/disposal facility; and any additional health and safety requirements for site personnel.

The Department's environmental representative will conduct a health and safety briefing prior to commencement of activities on the sites to insure an understanding of all applicable standards, guidelines, laws, procedures, etc. consistent with the successful completion of this type of activity. The Department's environmental representative will conduct air monitoring during any excavation activities at the site to identify and mitigate fire, explosion and vapor hazards.

The Department's environmental representative shall coordinate the excavation activities with all applicable local, state, and federal environmental regulatory agencies. The Department's environmental representative will also oversee the excavation, removal and treatment/disposal of the material in the designated area(s) and perform such tests as field screening for soil contamination utilizing vapor monitoring techniques and collect soil samples for laboratory analysis to meet the requirements of the treatment/disposal facility, DNREC and/or the USEPA. The Department's environmental representative's personnel will subcontract with the disposal/treatment facility to provide transportation and disposal/treatment of all contaminated materials to be removed as part of the project. The Department's environmental representative is responsible for measuring the quantity of contaminated material removed, via certified scale weights, for the Department's records.

Method of Measurement:

The quantity of contaminated material will not be measured. It will be included in the excavation quantity.

Basis of Payment:

No additional payment will be made for the handling of contaminated material included in the excavation quantities. Contractor's costs for handling contaminated material as described herein are to be included in the standard excavation pay items included in this contract, and will constitute full compensation for excavation, constructing and maintaining the segregated soil staging area, placement of the contaminated soil in the staging area, providing plastic and daily covering of the segregated soil staging area, and loading of contaminated soil for removal by the Department.

This item is a contingency item and the Department reserves the right to delete from the Contract. The Contractor shall make no claims for additional compensation because of deletion of the item.

04/04/2014

207500 - COFFERDAMS

Description:

This work consists of furnishing all materials, designing and constructing cofferdams in accordance with the notes on the Plans, this Special Provision and as directed by the Engineer.

Materials:

The type of cofferdam to be constructed shall be selected by the Contractor, however, the design and construction shall be in accordance with the applicable requirements of Section 207 of the Standard Specifications.

Construction Methods:

The Contractor shall submit to the Department's Bridge Section and Stormwater Section for approval, design calculations, detailed layout, working drawings and construction methods, for cofferdam or for other diversion structure as shown on the Plans at least two weeks prior to initiating its construction. The entire submission shall be signed and sealed by a Professional Engineer registered in the State of Delaware prior to submitting to the Department. The Contractor may submit for approval, proprietary diversion device(s) such as PORTADAM or AQUA-BARRIER or approved equal.

Basis of Payment:

The quantity of cofferdams will be paid for at the Contract lump sum. Price and payment will constitute full compensation for furnishing and placing all materials, for design, submission of signed and sealed drawings, installation and removal of materials for cofferdam or any other device(s) used, any excavation in excess of that required for the structure as defined under Subsection 207.06 of the Standard Specifications, unless otherwise covered for payment on the Plans under a different Section, bailing, pumping and draining, sheeting, shoring, for all labor, equipment, tools and incidentals required to complete the work.

12/10/12

209503 - BRIDGING LAYER

Description:

The work covered by this section consists of providing all labor, materials, and equipment and performing all operations required to place geotextile soil reinforcement and reinforced fill in the designated areas as specified herein and shown on the Plans.

Materials:

Reinforced Fill. Reinforced fill material shall meet the gradation requirements for Type B Course Aggregate (Crusher Run) as indicated under Standard Specifications 821, along with all backfill requirements indicated under Special Provisions 602772.

Soil Reinforcement. The Contractor shall select a geosynthetic or geogrid soil reinforcement having the following minimum properties in the transverse direction of the retained embankment, or perpendicular to the MSE retaining walls:

Creep limited strength at 5% strain: 900 lbs/ft
Ultimate Strength per ASTM D 6637 of 10,500 lbs/ft
Coefficient of Interaction for direct sliding per ASTM 5321 of 0.8

Multiple layers of geosynthetic or geogrid may be used to provide the minimum required properties. A minimum 6 inch vertical spacing is required between reinforcement layers.

Construction Methods:

Prior to construction of the bridging layer, the Contractor shall prepare subgrade, remove all deleterious materials, install all driven H piles and pour the cast-in-place grade beams and mat pile footing.

The reinforced fill shall be placed in horizontal layers not exceeding 8 inches in uncompacted thickness for heavy compaction equipment.

The soil reinforcement shall be placed at the locations and elevations shown on the Plans.

Construction equipment shall not be operated directly on the geosynthetic reinforcement. A minimum fill thickness of 6 inches is required for operation of vehicles over the reinforcement. Turning of vehicles should be kept to a minimum to prevent tracks or tires from displacing the fill and/or soil reinforcement.

Minimum overlap of adjacent rolls of reinforcement shall be 2 feet.

No changes to the soil reinforcement layout shall be made without written approval of the Engineer.

Method of Measurement:

Placement of the reinforced fill and soil reinforcement that constitute the Bridging Layer will be paid per square foot of plan area for supply and installation of reinforced fill and soil reinforcement meeting the requirement specified herein.

Basis of Payment:

The payment for the construction of the Bridging Layer will be full compensation for furnishing and placing soil reinforcement and reinforced fill, and all labor, tools, equipment and incidentals necessary to complete the placement of the Bridging Layer within the limits specified on the Plans.

11/24/15

401699 - QUALITY CONTROL/QUALITY ASSURANCE OF BITUMINOUS CONCRETE

.01 Description

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

.02 Bituminous Concrete Production – Quality Acceptance

(a) Material Production - Tests and Evaluations.

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

Supply and capture samples, as directed by the Engineer under the purview of the Engineer from delivery trucks before the trucks leave the production plant. Hand samples to the Engineer to be marked accordingly. The sample shall represent the material produced by the Contractor, and shall be of sufficient size to allow the Engineer to complete all required acceptance tests. The Engineer will direct the Contractor when to capture these samples, on a statistically random, unbiased basis, established before production begins each day based upon the anticipated production tonnage. The captured sample shall be from the Engineer specified delivery truck. The Contractor may visually inspect the specified delivery load during sampling and elect to reject the load. If the contractor elects to reject the specified delivery truck, each subsequent load will be inspected until a visually acceptable load is produced for acceptance testing. All visually rejected loads shall not be sent to a Department project.

The first sample of the production day will be randomly generated by the Engineer between loads 0 and 12 (0-250 tons). Subsequent samples will be randomly generated by the Engineer on 500-ton sub-lots for the production day. Samples not retrieved in accordance with the Contractor's QC plan will be deemed unacceptable and may be a basis for rejection of material produced. Parallel tests or dispute resolution tests will only be performed on material captured at the same time and location as the acceptance test sample. Parallel test samples or Dispute Resolution samples will be created by splitting a large sample or obtaining multiple samples that equally represent the material. The Engineer will perform all splitting and handling of material after it is obtained by the Contractor.

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

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

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

production. If the actual production is going to be 50 tons or greater over the anticipated sub lot production, a new sample location will be determined on a statistically random, unbiased basis based upon the new actual production. The Engineer will combine the evaluation and test results for all of the applicable sublots in order to evaluate each individual lot.

If the Engineer is present, and the quantity exceeds 25 tons, a statistically random sample will be used for analysis. When the anticipated production is less than 100 tons and greater than 25 tons, and the Engineer is not present, the contractor shall randomly select a sample using the Engineer's random location program. The captured sample shall be placed in a suitable box, marked to the attention of the Engineer, and submitted to the Engineer for testing. A box sample shall also be obtained by the contractor at the same time and will be used as the Dispute Resolution sample if requested by the Engineer. The Contractor shall also obtain one liquid asphalt sample (1 pint) per grade of asphalt used per day and properly label it with all pertinent information.

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

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

(b) Pavement Construction - Tests and Evaluations.

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

Notify the Engineer of any locations within that road segment that may not be suitable to achieve minimum (93%) compaction due to existing conditions prior to paving the road segment. Schedule and hold a meeting in the field with the Engineer in order to discuss all areas that may potentially be applicable to Table 5a before paving starts. Areas that will be considered for Table 5a will be investigated in accordance to the method described in Appendix B. If this meeting is not held prior to paving, no areas will be considered for Table 5a. Areas of allowable exemptions that will not be cored include the following: partial-depth patch areas, driveway entrances, paving locations of less than 100 tons, areas around manholes and driveway entrances, and areas of paving that are under 400 feet in continuous total length and/or 5 feet in width. The exempt areas around manholes will be a maximum of 4 feet transversely on either side from the center of the manhole, and 20 feet longitudinally on either side from the center of the manhole. The exempt areas around driveway entrances shall be the entire width of the driveway, and 3 feet from the edge of the longitudinal joint next to the driveway. Areas of exemption that will be cored for informational purposes only include: areas where the mat thickness is less than three times the nominal maximum aggregate size as directed by the Engineer, violations of Section 401.08 in the Standard Specifications as directed by the Engineer, and areas shown to contain questionable subgrade properties as proven by substantial yielding under a fully legally loaded truck. Failure to obtain core samples in these areas will result in zero payment for compaction regardless of the exempt status.

The Engineer will evaluate and accept the compaction work on a daily basis. Payment for the compaction will be calculated by using the material production lots as referenced in **.02 Acceptance Plan (a) Material Production - B Tests and Evaluation** and analyzing the compaction results over the individual days covered in the material production lot. The compaction results will be combined with the material results to obtain a payment for this item.

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

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

Testing locations will be a minimum of 1.0 feet from the newly placed longitudinal joint and 50 feet from a new transverse joint.

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

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

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

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

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

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

- AASHTO T166, Method C (Rapid Method) – Bulk Specific Gravity of Compacted Hot Mix Asphalt (HMA) Using Saturated Surface Dry Specimens
- AASHTO T209 - Theoretical Maximum Specific Gravity and Density of Hot Mix Asphalt
- ASTM D7227 - Standard Practice for Rapid Drying of Compacted Asphalt Specimens using Vacuum Drying Apparatus

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

.03 Payment and Pay Adjustment Factors.

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

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

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

(a) Material Production - Pay Adjustment.

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

Table 2 - Material Parameter Weight Factors

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

Using the JMF target value, the single test tolerance (from Table 2), and the test values, the Engineer will use the following steps to determine the material pay adjustment factor for each lot of material:

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

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

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

In lieu of being assessed a pay adjustment penalty, the Contractor may choose to remove and replace the material at no additional cost to the Department. When the PWL of any material parameter in Table 2 is below 60, the Engineer may require the removal and replacement of the material at no additional cost to the Department. Test results on removed material shall not be used in calculation of future PWL calculations for Mixture ID.

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

When a sample is outside of the allowable single test tolerance for any Materials criteria in Table 2, that sample will be isolated. For payment purposes, the test result of the out of acceptable tolerance sample will be combined with the two previous acceptable samples of the same JMF and analyzed per this specification. The material that is considered out of the acceptable tolerance will only include the material within the represented sub-lot (i.e., a maximum of 500 tons). If the previous acceptable test result is from the previous production day, only the material produced on the second production day will be considered out of tolerance. All future sub lots will not include the isolated test. The pay factors for the out of tolerance sample lot will be calculated using column C of table 4.

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

Table 3 – Quality Level Analysis by the Standard Deviation Method

PU or PL	QU and QL for "n" Samples						
	n = 3	n = 4	n = 5	n = 6	n = 7	n = 8	n = 9
100	1.16	1.50	1.79	2.03	2.23	2.39	2.53
99	-	1.47	1.67	1.80	1.89	1.95	2.00
98	1.15	1.44	1.60	1.70	1.76	1.81	1.84
97	-	1.41	1.54	1.62	1.67	1.70	1.72
96	1.14	1.38	1.49	1.55	1.59	1.61	1.63
95	-	1.35	1.44	1.49	1.52	1.54	1.55
94	1.13	1.32	1.39	1.43	1.46	1.47	1.48
93	-	1.29	1.35	1.38	1.40	1.41	1.42
92	1.12	1.26	1.31	1.33	1.35	1.36	1.36
91	1.11	1.23	1.27	1.29	1.30	1.30	1.31
90	1.10	1.20	1.23	1.24	1.25	1.25	1.26
89	1.09	1.17	1.19	1.20	1.20	1.21	1.21
88	1.07	1.14	1.15	1.16	1.16	1.16	1.17
87	1.06	1.11	1.12	1.12	1.12	1.12	1.12

86	1.04	1.08	1.08	1.08	1.08	1.08	1.08
85	1.03	1.05	1.05	1.04	1.04	1.04	1.04
84	1.01	1.02	1.01	1.01	1.00	1.00	1.00
83	1.00	0.99	0.98	0.97	0.97	0.96	0.96
82	0.97	0.96	0.95	0.94	0.93	0.93	0.93
81	0.96	0.93	0.91	0.90	0.90	0.89	0.89
80	0.93	0.90	0.88	0.87	0.86	0.86	0.86
79	0.91	0.87	0.85	0.84	0.83	0.82	0.82
78	0.89	0.84	0.82	0.80	0.80	0.79	0.79
77	0.87	0.81	0.78	0.77	0.76	0.76	0.76
76	0.84	0.78	0.75	0.74	0.73	0.73	0.72
75	0.82	0.75	0.72	0.71	0.70	0.70	0.69
74	0.79	0.72	0.69	0.68	0.67	0.66	0.66
73	0.75	0.69	0.66	0.65	0.64	0.63	0.63
72	0.74	0.66	0.63	0.62	0.61	0.60	0.60
71	0.71	0.63	0.60	0.59	0.58	0.57	0.57
70	0.68	0.60	0.57	0.56	0.55	0.55	0.54
69	0.65	0.57	0.54	0.53	0.52	0.52	0.51
68	0.62	0.54	0.51	0.50	0.49	0.49	0.48
67	0.59	0.51	0.47	0.47	0.46	0.46	0.46
66	0.56	0.48	0.45	0.44	0.44	0.43	0.43
65	0.52	0.45	0.43	0.41	0.41	0.40	0.40
64	0.49	0.42	0.40	0.39	0.38	0.38	0.37
63	0.46	0.39	0.37	0.36	0.35	0.35	0.35
62	0.43	0.36	0.34	0.33	0.32	0.32	0.32

Table 3 – Quality Level Analysis by the Standard Deviation Method

PU or PL	QU and QL for "n" Samples						
	n = 3	n = 4	n = 5	n = 6	n = 7	n = 8	n = 9
61	0.39	0.33	0.31	0.30	0.30	0.29	0.29
60	0.36	0.30	0.28	0.27	0.27	0.27	0.26
59	0.32	0.27	0.25	0.25	0.24	0.24	0.24

Table 4 - PWL Pay Adjustment Factors

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

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

(b) Pavement Construction - Pay Adjustments.

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

- Degree of compaction of the in-place material

Using the test values for the cores, the Engineer will use the following steps to determine the pavement construction pay adjustment for each lot of work. .

1. Calculate the core bulk specific gravity values from the sublot tests values, to the nearest 0.001 unit. Obtain the Theoretical maximum Specific Gravity values from the corresponding laboratory sublot tests.
2. Calculate the Degree of Compaction:
   Degree of Compaction =
   ((Core Bulk Specific Gravity) / (Theoretical Maximum Specific Gravity)) x 100% recorded to the nearest 0.1%.
3. The average compaction for the sublots shall be averaged together for the compaction level of the lot. The lots compaction test level shall be averaged and recorded to the nearest whole percent.
4. Locate the value of the Payment Adjustment Factor corresponding to the calculated degree of compaction from Table 5 or Table 5a.
5. Determine the pavement construction price adjustment by using the following formula:
   Construction Pay adjustment = (Lot Quantity) x (Bid Price) x (Pay Adjustment Factor) x 30%.

Table 5: Compaction Price Adjustment Highway Locations		
Degree of Compaction (%)	Range	Pay Adjustment Factor (%)
>= 97.0	>= 96.75	-100*
96.5	96.26 – 96.74	-5
96.0	95.75 – 96.25	-3
95.5	95.26 – 95.74	-2
95.0	94.75 – 95.25	0
94.5	94.26 – 94.74	0
94.0	93.75 – 94.25	1
93.5	93.26 – 93.74	3
93.0	92.75 – 93.25	5

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

* or remove and replace it at Engineer's discretion

Table 5A: Compaction Price Adjustment Other[1] Locations		
Degree of Compaction	Range	Pay Adjustment Factor (%)
>= 97.0	>= 96.75	-100*
96.5	96.26 – 96.74	-5
96.0	95.75 – 96.25	-3
95.5	95.26 – 95.74	-2
95.0	94.75 – 95.25	0
94.5	94.26 – 94.74	0
94.0	93.75 – 94.25	0
93.5	93.26 – 93.74	1
93.0	92.75 – 93.25	3
92.5	92.26 – 92.74	1
92.0	91.75 – 92.25	0
91.5	91.26 – 91.74	0
91.0	90.75 – 91.25	0
90.5	90.26 – 90.74	0
90.0	89.75 – 90.25	0
89.5	89.26 – 89.74	0
89.0	88.75 – 89.25	-1
88.5	88.26 – 88.74	-3
88.0	87.75 – 88.25	-5
87.5	87.26 – 87.74	-10

87.0	86.75 – 87.25	-15
86.5	86.26 – 86.74	-20
86.0	85.75 – 86.25	-25
85.5	85.26 – 85.74	-30
85.0	84.75 – 85.25	-40
84.5	84.26 – 84.74	-50
=< 84.0	=<84.25	-100*

* or remove and replace at Engineer's discretion

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

.04 Dispute Resolution.

Disputes or questions about any test result shall be brought to the attention of the Contractor and the Engineer within two operational days of reported test results. The following dispute resolution procedures will be used.

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

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

When disputes over production testing occur, the samples used for Dispute Resolution testing will be those samples the properly captured, labeled, and stored, as described in the second paragraph of the section of these specifications titled **.02 Acceptance Plan, (a) Material Production - Tests and Evaluations**. If no samples are available, the original testing results will be used for payment calculations.

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

If there is a discrepancy between the Engineer's acceptance test result and the Contractor's test result, the Contractor may ask for the Dispute Resolution sample to be tested. The Contractor may request up to two dispute resolution samples be tested per calendar year without charge. Any additional Dispute Resolution samples run at the Contractors request where the results substantiate the acceptance test result will be assessed a fee of $125. Any additional Dispute Resolution samples that substantiate the Contractors test result will not be assessed the fee.

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

Appendix A - Repairing Core Holes in Bituminous Asphalt Pavement

Description.

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

Materials and Equipment.

The following material shall be available to complete this work:

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

The following equipment shall be available to complete this work:

- Sponge or other absorbent material - Used to extract water from the hole.
- Compaction Hammer - mechanical (electrical, pneumatic, or gasoline driven) tamping device with a flat, circular tamping face smaller than 6 inches in diameter.

Construction Method.

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

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

Performance Requirements.

The Engineer will judge the patch on the following basis:

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

Basis of Payment.

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

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

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

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

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

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

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

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

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

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

Structural Number Calculations

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

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

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

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

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

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

Example:

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

Calculation:

For the Type B lift the calculation would be:

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

For the Type C lift the calculation would be:

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

11/3/14

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

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

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

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

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

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

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

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

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

401829 - BITUMINOUS CONCRETE, SUPERPAVE, TYPE C, 115 GYRATIONS, PG 70-22, (NON-CARBONATE STONE)

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

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

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

.01 Description:

This specification shall govern the production and construction of bituminous concrete pavement. The following Subsections of the Standard Specifications shall be applicable: 401.01, 401.03 - 401.10, 401.12, and 401.13. All other subsections have been modified herein.

Payment for bituminous concrete shall be in accordance with item 401699. The Contractor shall read and thoroughly understand the requirements of the QA/QC specification as defined in item 401699. It is the responsibility of the Contractor to determine all costs associated with meeting these requirements and to include them in the per ton bids for the various Superpave bituminous concrete items. Payment adjustment factors will be calculated in accordance with the latest version of item 401699.

Bituminous concrete may be produced by one or a combination of several technologies involving asphalt foaming processes and equipment or additives that facilitate the reduction of the temperature at which the mix can be placed and satisfactorily compacted thereby permitting the mix to be produced at reduced temperatures.

.02 Materials:

Use materials conforming to standard specifications 823.

Materials for bituminous concrete shall conform to the requirements of Subsections 823.01, 823.05-823.17, and 823.25 - 823.28 of the Standard Specifications and the following. If the Contractor proposes to use a combination of materials that are not covered by this Specification, the mix design shall be submitted and reviewed by the Engineer 30 calendar days prior to use.

a) **Asphalt Binder:**

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

TEST Procedure	AASHTO REFERENCE	SPECIFICATION LIMITS
Temperature, °C	M 320	Per Grade
Original DSR, G*/sin (δ)	T 315	1.00 - 2.20 kPa[1]
RTFO DSR, G*/sin (δ)	T 315	>/= 2.20 kPa
PAV DSR, G*/ sin (δ)	T 315	</=5000 kPa

TEST Procedure	AASHTO REFERENCE	SPECIFICATION LIMITS
BBR Creep Stiffness, S	T 313	</= 300.0 kPa
BBR m-value	T 313	>/=0.300

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

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

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

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

b) **Recycled Materials:**

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

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

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

c) **Shingles:**

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

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

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

d) Mineral Aggregate:

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

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

[1]Coarse Aggregate Angularity is tested according to ASTM D5821.
[2]Fine Aggregate Angularity is tested according to AASHTO TP-33.
[3]Clay Content is tested according to AASHTO T176.
[4]Flat and Elongated is tested according to ASTM 4791 with a 5:1 aspect ratio.
[5] 85/80 denotes that 85% of the coarse aggregate has one fractured face and 80% has two or more fractured faces.

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

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

For any roadway with a minimum average daily traffic volume (ADT) of 8000 vehicles and a posted speed of 35 mph (60 kph) or greater, the polish value of the composite aggregate blend shall be greater than 8.0 when tested according to Maryland State Highway Administration MSMT 411 B ALaboratory Method of Predicting Frictional Resistance of Polished Aggregates and Pavement Surfaces.@ RAP shall be assigned a value of 5.0. The Contractor shall supply all polish values to the Engineer upon request.

e) **Mineral Filler:**

Conform to AASHTO M17.

f) **Warm Mix Additives:**

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

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

Follow the manufacturer's recommendation for incorporating additives and WMA technologies into the mix. Comply with the manufacturer's recommendation regarding receiving, storage, and delivery of additives.

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

g) **Anti-stripping additives**

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

.03 Bituminous Concrete Production – Quality Control

(a) Process Control - Material Production Quality Control.

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

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

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

- Production Plant - make, type, capacity, and location.
- Production Plant Calibration - components and schedule; address documentation.
- Personnel - include name and telephone number for the following individuals:
- Person responsible for quality control.
- Qualified technician(s) responsible for performing the inspection, sampling, and testing.
- Person who has the authority to make corrective actions on behalf of the Contractor.
- Testing Laboratory - state the frequency of accuracy checks and calibrations of the equipment used for testing; address documentation.
- Load number of QC samples (1-10 if QA sample is not within trucks 1-10)
- Locations where samples will be obtained and the sampling techniques for each test
- Tests to be performed and their normal frequency; the following, at a minimum, shall be conducted:
  - Mixture Temperature: each of the first five trucks, and each load that is sampled for QC or acceptance testing.
  - Gradation analysis of aggregate (and RAP) stockpiles - one washed gradations per week for each aggregate stockpile; RAP: five gradations and asphalt cement contents for dedicated stockpiles

where new material is not being added; one gradation and asphalt cement content test per week for stockpiles where material is continually being added to the stockpile.
  - Gradation analysis of non-payment sieves
  - Dust to effective asphalt calculation
  - Moisture content analysis of aggregates - daily.
  - Gradation analysis of the combined aggregate cold feed - one per year per mixture.
  - Bulk specific gravity and absorption of blended material - one per year per mixture.
  - Ignition Oven calibration - one per year per mixture.
  - Hot-Bins: one per year per mixture.
  - Others, as appropriate.
- Procedures for reporting the results of inspection and tests (include schedule).
- Procedures for dealing with non-compliant material or work.
- Presentation of control charts. The contractor shall plot the results of testing on individual control charts for each characteristic. The control charts shall be updated within on working day as test results for each sublot become available. The control charts shall be easily and readily accessible at the plant laboratory. The following parameters shall be plotted from the testing:
  - Asphalt cement content.
  - Volumetrics (air voids, voids in mineral aggregates [VMA])
  - Gradation values for the following sieves:
    - 4.75 mm (#4).
    - 2.36 mm (#8).
    - 0.075 mm (#200).
    - Operational guidelines (trigger points) to address times when the following actions would be considered:
      - Increased frequency of sampling and testing.
      - Plant control/settings/operations change.
      - JMF adjustment.
      - JMF change (See 401644 Section .04(a)(1)).
      - Change in the source of the component materials.
      - Calibration of material production equipment (asphalt pump, belt feeders, etc.).
      - Rejection of material.

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

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

- Using testing equipment that is knowingly out of calibration or is not working properly.
- Reporting false information such as test data, JMF information, or any info requested by DelDOT
- Failure to perform materials testing per their approved QC Plan
- Deviating from AASHTO or DelDOT testing procedures.
- Use of any material or the use of a JMF component in a proportion that exceeds the allowable tolerance as specified in section 04(a)(1) of this specification not listed in the JMF.
- Use of the wrong PG graded asphalt.
- Failure to take corrective action per action points in the Contractors approved QC plan.

The following steps will be taken for violations listed above:

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

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

(b) Material Production Test Equipment.

Establish, maintain, and operate a qualified testing laboratory at the production plant site of sufficient size and layout that will accommodate the testing operations of both the Contractor and the Engineer.

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

Maintain all the equipment used for handling, preparing, and testing materials in proper operating condition. For any laboratory equipment malfunction, the Contractor shall remedy the situation within one working day or the Engineer may suspend production. In the case of an equipment malfunction, the Engineer may elect to test the material at another qualified testing laboratory while waiting for repairs to equipment.

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

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

(c) Material Production Test Methods

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

.04 Job Mix Formula (JMF)

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

a) Development of JMF

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

In addition to the results of the material requirements specified above, the following material properties shall be provided by the contractor: bulk specific gravity Gsb, apparent specific gravity Gsa, and the absorption of the individual aggregate stockpiles to be used, tested according to AASHTO T84 and AASHTO T85 and reported to three decimal places along with the specific gravity of the mineral filler to be used, tested according to AASHTO T100 and reported to three decimal places.

Superpave Gyratory Compactive (SGC) Effort:

The Superpave Gyratory Compaction effort employed throughout mixture design, field quality control, or field quality assurance shall be as indicated below. All mixture specimens tested in the SGC shall be compacted to N_M Height data provided by the SGC shall be employed to calculate volumetric properties at N_I, N_D, and N_M

Superpave Gyratory Compactive (SGC) Effort:

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

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

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

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

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

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

Gradation Control Points:

The combined aggregates shall conform to the gradation requirement specified in the following table when tested according to T-11 and T-27.

TABLE 1

Nominal Maximum Aggregates Size Control Points, Percent Passing										
	25.0 MM		19.0 MM		12.5 MM		9.5 MM		4.75 MM	
SIEVE SIZE	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
37.5 MM	100	-	-	-	-	-	-	-	-	-
25.0 MM	90	100	100	-	-	-	-	-	-	-
19.0 MM	-	90	90	100	100	-	-	-	-	-
12.5 MM	-	-	-	90	90	100	100	-	100	-
9.5 MM	-	-	-	-	-	90	90	100	95	100
4.75 MM	-	-	-	-	-	-	-	90	90	100
2.36 MM	19	45	23	49	28	58	32	67	-	-
1.18 MM	-	-	-	-	-	-	-	-	30	60
0.075 MM	1	7	2	8	2	10	2	10	6	12

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

Gradation Classification

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

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

Plant Production Tolerances:

Volumeric Property	Superpave Criteria
Air Voids (V_a) at (%) N_m	2.0 (min)
Air Voids (V_a) at N_{design} (%)	6.0 (max)
Voids in Mineral Aggregate (VMA) at N_{design}	
25.0 mm Bituminous Concrete Base Course	-1.5
19.0 mm Type B Hot-Mix	+2.0
12.5 mm Type C Hot-Mix	
9.5 mm Type C Hot-Mix	
4.5 mm Type C Hot-Mix	

The proposed JMF shall include the following:

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

1. Job mix formula (JMF) design of the component materials and target characteristic values for each mixture proposed for use. The component materials design shall include designating the source and the expected proportion (within 1 percent for the aggregate components and within 0.1 percent for the other components) of each component to be used in order to produce workable bituminous concrete meeting the specified properties. Recycled Asphalt Pavement (RAP) is one individual aggregate component regardless of fractionation size. Recycled Asphalt Shingles (RAS) is a separate component from RAP.

2. The JMF target characteristic values include the mixing temperature range, core temperature range for gyration, the percentage of the asphalt cement component (both total and virgin), and the percentages of the aggregate amounts retained on the sieves to be addressed by the JMF as shown in Table 1.

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

4. Plot of the three trial asphalt binder contents at +/- 0.5% gyratory compaction curves where the percent of maximum specific gravity (% of G_{mm}) is plotted against the log base ten of the number of gyrations (log (N)) showing the applicable criteria for N_i, N_d, and $N_{m.}$

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

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

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

7. Test data with each JMF and tests performed by a Qualified Laboratory on representative materials, verifying the adequacy of the design. Refer to the specifications for each mix type in order to determine the design requirements. The JMF sieve percentage values shall conform to the ranges shown in Table 1.

   For any mixture that has a 20% or greater failure rate on any combined volumetric criteria, the JMF will not be approved for use on Department contracts.

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

.05 Approval of JMF

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

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

a) **Design Evaluation:**

The Engineer may elect to evaluate the proposed JMF and suitability of all materials through laboratory trial batches. All materials requested by the Engineer shall be provided at the contractor's expense

to the Central Laboratory in Dover in a timely manner upon request. To verify the complete mixture design and evaluate the suitability of all materials, the following approximate quantities are required:

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

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

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

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

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

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

.06 Construction.

(a) Pavement Construction Test Equipment.

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

Weather Limitations.

Place mix only on dry, unfrozen surfaces and only when weather conditions allow for proper production, placement, handling, and compacting. The following table of ambient temperatures for various binder grades and lift thicknesses for placement with the following parameters:

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

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

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

Compaction:

(b) Pavement Construction - Process Control.

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

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

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

Repair all core holes in accordance with 401699 Appendix A.

Method of Measurement:

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

Basis of Payment:

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

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

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

10/29/2014

601520 - TEMPORARY TIMBER MAT

Description:

The item shall consist of furnishing all materials and constructing a temporary timber mat roadway for access across the designated wetland areas as shown on the Plans and as directed by the Engineer. All equipment shall utilize this temporary timber mat roadway during construction and staging of the wetland boardwalk to avoid permanent disturbance and damage to the surrounding wetland area.

Materials:

In accordance with Section 601 of the Standard Specifications and the following:

Timber shall have a strength and grade adequate to support the Contractor's anticipated vehicular or equipment loads. Any preservative treatment applied to the matting shall be environmentally safe for wet conditions and be preapproved by the Department.

Hardware shall be in accordance with Section 601.07 of the Standard Specifications.

Construction Methods:

The Contractor shall submit to the Department for approval shop drawings and design calculations indicating the layout, size of members, arrangement of members and the construction methods at least two weeks prior to initiating construction. This information shall be signed and sealed by a Professional Engineer registered in the State of Delaware. The actual timber mat system utilized for the construction shall be designed for the anticipated construction loads and shall be compatible with the environment. Placement of stone within the wetland area is not permitted.

The temporary timber matting should be periodically inspected by the Contractor and any damaged or deteriorated components should be replaced. The Contractor assumes full responsibility for the load carrying capability of the system and for its anchorage, as required, to resist high water flows. No additional compensation will be granted for repairing any portion of the system damaged during naturally occurring weather events or contractor usage. The Contractor is responsible for retrieving lost mats and repairing any damage caused by naturally occurring weather events.

Basis of Payment:

The payment for the item shall be made for at the contract unit price bid per Lump Sum for "601520 - Temporary Timber Mat", which price and payment shall constitute full compensation for furnishing and placing all materials, for design, submission of signed and sealed drawings and computations, installation and removal of timber mat materials, and for all labor, equipment, tools and incidentals required to complete the work.

8/13/15

601536 - PREFABRICATED GLUED-LAMINATED TIMBER ARCH

Description:

This item consists of the design, fabrication, supply, and erection of a prefabricated, glued-laminated timber arch pedestrian bridge as shown and described on the Plans, as directed by the Engineer, and as required by these Special Provisions.

Materials:

1. Glued Laminated Timber

   The glulam members shall be West Coast Douglas Fir supplied in the grade(s) as specified by the design. All glulam materials shall conform to the requirements of ANSI/AITC A190.1 and shall be stamped with an AITC quality mark or an APA-EWS trademark. The stamp shall be placed on surfaces that will not be exposed to view in the completed structure. The Contractor shall submit certificates of conformance indicating that the glulam members conform to the requirements of ANSI/AITC 190.1. The appearance of the glulam shall be Industrial in accordance with the American Institute of Timber Construction's Design Standards AITC 110-2001, "Standard Appearance Grades for Structural Glued Laminated Timber" except where indicated otherwise.

2. Adhesives

   Adhesives used in the glulam manufacturing process shall be capable of developing a shear strength in excess of the wood capacity and conform to the Voluntary Product Standard PS-56-73 of the U.S. Department of Commerce, National Bureau of Standards and AITC 405-2008, "Standard for Adhesives for Use in Structural Glued Laminated Timber" for wet use adhesives. All milling and gluing shall be performed prior to treating.

3. Steel and Hardware

   The manufacture shall supply all necessary steel and hardware necessary to assemble the bridge. All steel plating shall be ASTM A304 stainless steel and all hardware (bolts, nuts, washers) shall be ASTM A193 B8 Class 2 stainless steel. All cable shall be AISI 316 Stainless steel. Any required welding shall be performed by certified welders in accordance with D1.5 of the AWS Specifications.

4. Preservatives

   All glue laminated members shall be incised and fully fabricated prior to applying a preservative treatment. All holes shall be factory drilled to the extent possible. All glue laminated arch members shall be treated with 5% Pentachlorophenol Type 'A' preservative to a minimum net retention of 0.6 pcf in accordance with the American Wood Protection Association's (AWPA) U1-15 User Specification for Treated Wood and T1-14 Processing and Treatment Standard. All timber wearing surface deck planks shall be treated with 5% Pentachlorophenol Type 'C' preservative to a minimum net retention of 0.5 pcf in accordance with the AWPA U1-15 User Specification for Treated Wood and T1-14 Processing and Treatment Standard. All glue laminated deck panels shall be treated with a Copper Naphthenate Preservative to a minimum net retention of 0.075 pcf in accordance with AWPA U1-15 User Specification for Treated Wood and T1-14 Processing and Treatment Standard. Preservatives used in the pressure treatment process shall conform to AWPA Standard P35 (Pentachlorophenol) and P36 (Copper Naphthenate) and shall conform to Best Management Practices (BMP'S). The manufacturer shall supply a certificate that each glue laminated member has been properly treated in accordance with this Special Provision and the requirements of AWPA UC4B. Any field cuts and/or bores shall be treated with a Copper Naphthenate preservative per AWPA M4.

5. Handrails

   Reference the Special Provisions elsewhere for requirements of the handrail system to be installed on the prefabricated, glued-laminated timber arch pedestrian bridge. Working drawings of the proposed hand railing shall be submitted to the Engineer for review and approval.

Install the glued laminated timber arch hand railing with engineered and fabricated mounting systems capable of withstanding the following structural loads without exceeding the factored resistance of the materials for hand railing, anchorage, and connections. Apply each load to produce the maximum stress in each of the respective components comprising the glued laminated timber arch hand railing mounting system.

5.1 Horizontal Hand Railing Elements: capable of withstanding the following loads applied simultaneously:
   a. Distributed load of 50 pounds per linear foot of railing length applied simultaneously in both the vertical and horizontal directions upon each railing element.
   b. Concentrated 200 pound load which acts simultaneously with the distributed load in part 5.1.(a) at any point and in any direction at the top of the longitudinal element.

5.2 Vertical Posts:
   a. Concentrated load of 200 pounds acting simultaneously with a distributed load of 50 pounds per linear foot over the tributary railing panel width, applied at the centroid of the upper longitudinal rail element for railings with a total height of 5.0 feet or less.

Design:

The prefabricated, glued-laminated timber arch pedestrian bridge shall be designed in accordance with applicable provisions of the Delaware Department of Transportation "Bridge Design Manual", latest edition and the AASHTO LRFD Bridge Design Specifications, latest edition, and the AASHTO LRFD Guide Specifications for the Design of Pedestrian Bridges, December 2009. The loading shall be 90 psf for pedestrian live load, or an H-10 (i.e., 10 ton) live load vehicle, whichever governs the design of each individual component of the prefabricated, glued-laminated timber arch pedestrian bridge. Dynamic loading need not be applied for either the pedestrian live load, or an H-10 (i.e., 10 ton) live load vehicle. The deflection of the bridge due to the unfactored pedestrian live load shall be less than 1/360 of the span length when investigated at the service limit state using load combination Service I in Table 3.4.1-1 of the AASHTO LRFD Bridge Design Specifications. Horizontal deflections under factored wind loading shall not exceed 1/360 of the span length.

The assumed arch bearing and arch purlin reactions are as shown on the Plans and include assumed unfactored dead and live loads and unfactored horizontal thrust. If the Contractor's proposed arch reactions do not match those shown, the piers shall be revised accordingly by the Contractor to support those loads as required by his design. This may include a change in the size and detailing of the bearing seat and/or pier to support the proposed arch including a revision to the foundation design. Note that if a change in the size and detailing of any component of the pier is required, the geometric portions, architectural projection, and textured concrete finish as specified on the Plans and elsewhere within these Special Provisions shall be maintained. In addition to the requirements stipulated herein, any change in the pier design or foundation design shall be detailed in the Contractor's working drawings submittal. All changes shall be identified and he shall show all pertinent dimensions, reinforcement sizes, and reinforcement locations for approval by the Engineer. Similarly, changes in the foundation design shall also be similarly represented in the working drawing submittal. All calculations shall be certified by a registered Professional Engineer licensed in the State of Delaware. This working drawing submittal shall be in conjunction with the submittal requirements stipulated elsewhere within these Special Provisions.

Supplier:

The supplier of the prefabricated, glued-laminated timber arch pedestrian bridge shall be a company who specializes in the design and fabrication of timber pedestrian bridges and shall demonstrate a minimum of five (5) years of documented experience designing, fabricating, and supplying timber pedestrian bridges of the type and scope similar to that shown and described in the Plans. In addition, the manufacturer shall be licensed by the American Institute of Timber Construction (AITC) or the APA – The Engineered Wood Association (APA-EWS).

Submittals:

Complete design computations and fabrication plans shall be submitted to the Engineer for review as a working drawing submittal per Subsection 105.04 and approved prior to fabricating any components of the prefabricated, glued-laminated timber arch pedestrian bridge. The design computations and plans shall be prepared by and stamped by a registered Professional Engineer licensed in the State of Delaware. The

working drawings shall include, at a minimum, a general layout of the proposed structure, elevation and cross section, and fabrication details for all wood members and steel assemblies. The working drawings shall include all pertinent dimensions, wood grades, drilled holes, fasteners, cambers, connectors, type of preservative treatment, and an erection plan. The working drawings shall also show the layout of the glulam system and complete dimensions for each member. For each member, the species shall be indicated as well as the laminating combination, size, and shop performed fabrication. Calculations shall be provided for each member and connection showing their conformance with the specified design criteria.

Prior to completion of the working drawings, the supplier of the prefabricated, glued-laminated timber arch shall work with the project lighting supplier to coordinate the locations of all lighting conduit and fixtures, locations of junction boxes that require attachment to the glued-laminated timber arch, and any structural member sizing revisions as required to support the lighting conduit and fixtures. If any routing of lighting conduit is proposed through the interior of arch members, they shall be located prior to any drilling any holes in the structural arch members or application of the specified preservative treatment to the glued-laminated timber pedestrian bridge. Coordination between the supplier of the prefabricated, glued-laminated timber arch and the lighting supplier and contractor shall produce a consistent and well-coordinated set of working drawings for review and approval by the Engineer. They shall contain all dimensions and fabrication details necessary to install all lighting conduit, fixtures, and junction boxes to their final locations along the prefabricated glued-laminated timber arch.

The supplier of the prefabricated, glued-laminated timber arch pedestrian bridge shall furnish an AITC or APA-EWS Certificate of Conformance that the wood members conform to these Special Provisions and a Certificate of Treatment that all wood members have been pressure-treated in conformance with these Special Provisions. The supplier shall also supply a written warranty against defects in material and workmanship for a period of 5 years beginning with the date of final acceptance by the Department.

Prior to installation, the supplier shall provide a sample of the glulam member to be used in the arch portion of the structure. The sample shall provide an indication of the color variation, surfacing, distribution of growth characteristics such as knots, etc. that will be supplied for the actual members to be fabricated. A sample size of a minimum of 3 1/8” x 12” x 2’-0” shall be provided by the supplier for approval by the Engineer.

Construction Methods:

All materials, equipment, processes of manufacture, and the finished sections, including handling, storage, and transportation, will be subject to inspection and approval by the Department. Any defective construction, which may adversely affect the strength or performance of a section, shall be cause for rejection. Rejected sections shall be replaced at no additional expense to the Department.

All bridge materials shall be shall be unloaded and handled with a forklift or crane using nylon slings. Any bridge materials stored on site shall be placed on a level surface at least 6” off of the ground and stickered to prevent warping and twisting.

Erection of the prefabricated, glued-laminated timber arch pedestrian bridge shall be completed in accordance with the erection plan shown on the approved shop drawings. Each structural member shall be set in the locations and elevations as noted on the erection drawings. The Contractor shall make all necessary provisions for erection loads and shall provide any necessary temporary bracing to maintain the bridge in a true and plumb configuration until erection is complete. No wood member shall be field drilled, cut, or altered in any manner unless written approval is received from the supplier’s engineer.

Method of Measurement:

The quantity of Prefabricated Glued-Laminated Timber Arch will not be measured.

Basis of Payment:

The quantity of Prefabricated Glued-Laminated Timber Arch will be paid for at the Contract lump sum price for item 601536. Price and payment will constitute full compensation for furnishing all materials related to the prefabricated units; designing, preparing shop drawings, coordinating with the lighting supplier, fabricating and erecting the units on site, and for all labor, tools, and equipment and necessary incidentals to complete the work. Price and payment will also constitute full compensation for all materials, labor, tools,

equipment and incidentals necessary to construct structures associated with the arch (including but not limited to bearings, arch tie, arch suspenders, deck panel, railings, etc.) as specified on the Plans. If the pier design and detailing is revised by the Contractor, costs associated with this revision, including preparing the design calculations and any increase in material and/or labor costs will be incidental to the Contract lump sum price for Item 601536.

11/24/15

601537 - HARDWOOD IPE PLANK DECKING

Description:

This item consists of furnishing and installing hardwood ipe deck planking as shown and described on the Plans, as directed by the Engineer, and as required by these Special Provisions.

Materials:

1. Hardwood Ipe Plank Decking

   All decking shall be full thickness planks unless approved otherwise. Wood decking shall be naturally durable hardwood Ipe (Tabebuia Spp Lapacho Group). All planks shall be partially air dried to a moisture content of 20% or higher, and shall be supplied S4S (surfaced four sides), E4E (eased four edges), with the edges eased to a radius of 1/8". Measured at 25% moisture content, the width and thickness shall not vary from specified dimensions by more than ± 0.125" and ±0.0625", respectively. All planks shall be supplied with the end sealed with "Anchorseal" Mobil CER-M or an equal aquious wax log sealer. All planks shall be graded as FEQ (First Export Quality -) grading rules.

   All planks shall be naturally fire resistant without the use of any fire resistant preservatives to meet NFPA Class A and UBC Class I. Planks shall be supplied that meet or exceed the Static Coefficient of Friction for both Neolite and leather shoes in accordance with ASTM Test Method C1028-89.

   All planks shall meet or exceed the following mechanical properties (based on the 2" standard) as defined by the U.S. Forest Products Laboratory publications and testing data:

Bending Strength	22,475 psi
Modulus of Elasticity	3,145,000 psi
Max. Crush Strength	13,140 psi
Average air-dry density	56.7 to 59.3 pcf.
Basic specific gravity	0.85 - 0.97.
Janka side hardness	3,595 lbs at 12% moisture content

2. Hardware

   All hardware used to attach the hardwood ipe plank decking shall be 305 and 316 grade stainless steel screws.

Construction Methods:

To install, planks shall be placed tight together with no gaps. Every plank shall be attached with at least one fastener at each end. Self-tapping screws or hex-head bolts, with a steel plank hold down, are to be used at the ends of planks. Self-tapping screws or carriage bolts are to be used as interior connection fasteners when required. Power actuated fasteners shall not be used. Planks shall be drilled prior to installation of bolts and/or screws. At least one fastener shall be installed at each end of each plank. In addition, the contractor shall install, at every plank, at least two (2) fasteners located at a minimum of two interior stringer locations, approximately at the third points of the bridge width. Attachments at the ends of the planks may be modified as required if obstructions are present.

Method of Measurement:

The quantity of Hardwood Ipe Plank Decking will be measured by the square foot. The quantity will be determined from the actual length and width of the finished deck completed and accepted.

Basis of Payment:

The quantity of Hardwood Ipe Plank Decking will be paid for at the Contract unit price bid per square foot for item 601537 – Hardwood Ipe Plank Decking. Price and payment will constitute full compensation for furnishing and placing all materials, including hardware; for fabricating glue-laminated timber decks and members; and for all labor, equipment, tools, and incidentals required to complete the work.

08/11/2015

602646 - SILICONE ACRYLIC CONCRETE SEALER

Description:

This work consists of surface preparation, furnishing all materials, and application of a silicone acrylic concrete sealer to any concrete surface. The work shall be performed as indicated on the Plans, in accordance with these Specifications, and as directed by the Engineer.

Materials:

The concrete sealer shall consist of methyl methacrylate-ethyl acrylate copolymer resins and toning pigments suspended in solution of all times by a chemical suspension agent and solvent. Laminar silicates, titanium dioxides, and inorganic oxides may be used for toning pigments. Use of vegetable or marine oils, paraffin materials, stearates or organic pigments in the formulation shall not be permitted.

The Sealer shall be opaque, non-film forming, and penetrating silicone acrylic compound. The sealer shall pass NCHRP 244 Series-2, salt spray resistance requirements. The materials must be local OTC-VOC compliant.

The contractor shall provide Materials and Research Section one (1) quart sample from each batch of the silicone acrylic sealer compound supplied for chemical identification and testing.

The manufacturer shall supply a Materials Safety Data Sheet and a letter of certificate compliance of batch & lot of each shipment of the concrete sealer materials. The contractor shall also provide a manufacturer analysis report of the materials used with the specified batch shipped to the job site.

The color of the compound shall be off white (Federal Color #37925 of FED-STD-595B) or as specified on the plans.

Surface Preparation:

All new concrete surfaces, texturing, saw cutting, repointing and grooving shall be completed before the surface is prepared for sealer. All concrete that is to be sealed shall be cured for at least 28 days after casting or for the length of time specified in the manufacturer's instruction, which ever is longer. After 28 days, concrete surface shall be lightly sand or shot blasted, followed by vacuum cleaning in accordance with ASTM D 4258 & SSPC-SP-13 requirement to completely remove any applied curing compound, and to make surface lightly rough for penetration of sealer.

For existing concrete, all previous sealers and paints, all salt, efflorescence, laitance, and other foreign matter, and all loose material shall be completely removed using one or a combination of different preparation methods as specified in ASTM D-4258 and SSPC-SP 13.

In addition, both new and existing concrete shall receive a high pressure (3000-5000 psi) water washing at a flow of more than 4 gallons per minute, with zero degree of rotary nozzle. The contractor shall also allow the surface to dry for a minimum of 24 hours prior to the coating application after high-pressure washing. All surface preparation work shall be completed and approved by the Engineer before sealer the application can commence.

Construction Methods:

The sealer shall be used as supplied by the manufacturers without thinning or alteration unless specifically required in the manufacturer's instructions and verified by Engineer.

The silicone acrylic concrete sealer shall be applied to all exposed concrete surfaces as shown on the plans.

Concrete curing compounds, form release agents, and concrete hardeners may not be compatible with recommended coatings. Check for compatibility by applying a test patch of the recommended coating system, covering at least 20 to 30 square feet.

The concrete sealer material shall be applied using coverage rate and equipment in accordance with the manufacturer's recommendations.

A minimum of two coats shall be applied; all applications shall be performed under dry conditions with application-spread rate as recommended by the manufacturers.

The sealer shall be applied within the ambient temperature range as recommended by the manufacturer, when no rain is expected within a minimum of 12 hours following the application, and there are no high winds that would cause an improper application. If rain has preceded the application, the surface shall be allowed to dry at least 24 hours before waterproofing application begins.

Follow manufacturers recommendation for coating thickness. No drips, runs, or sags will be allowed during application. Natural bristle brush, roller, or spray can be used to perform the application. Follow manufacturers recommendation during application. No thinning of materials is permitted; all application procedures, and drying time between coats must be as per manufacturers recommendations.

The Contractor shall perform surface preparation and application of the concrete sealer material so as not to endanger any private and/or public property, pedestrians, workmen, and vehicles on, beneath or adjacent to the structure.

Method of Measurement:

The quantity of "Silicone Acrylic Concrete Sealer" will be measured by the square feet of area treated and accepted.

Basis of Payment:

The quantity of "Silicone Acrylic Concrete Sealer" will be paid for at the Contract unit price per square foot. Price and payment will constitute full compensation for furnishing all materials, furnishing and removing scaffolding as required, surface preparation, application of the concrete sealer material, disposal of discarded materials, and for all labor, tools, equipment, and all necessary incidentals to complete the work.

2/1/07

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 2014 AASHTO LRFD Bridge Design Specifications, 7th 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 75 years.

b. Completed walls shall have a welded wire mesh facing as described herein or noted on the Plans.

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.

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, $K_o = 1-\sin\varphi$, where φ is the angle of shearing resistance of the backfill material. For typical values of φ, 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:

$$A_c = (\text{Load at 3/4-inch displacement})/p_v dbN$$

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.

Materials:

The Contractor shall make arrangements to purchase or manufacture the welded wire mesh facing, 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.

Structural Geosythetics. Shall be made of polypropylene, select high density polyethylene or high-tenacity polyester fibers having a cross-section sufficient to permit significant mechanical interlock with the soil/backfill. Use geosynthetics having a high tensile modulus in relation to the soil/backfill. Use geosynthetics having high resistance to deformation under sustained long term design load while in service and resistant to ultraviolet degradation, to damage under normal construction practices and to all forms of biological or chemical degradation normally encountered in the material being reinforced.

Store the geosynthetics in conditions above 20°F and not greater than 140°F. Prevent mud, wet cement, epoxy, and like materials from coming into contact with and affixing to the geosynthetic material. Rolled geosynthetic may be laid flat or stood on end for storage. Cover the geosynthetic and protect from sunlight prior to placement in the wall system.

Carefully inspect all reinforcement, steel and geosynthetics to ensure they are the proper size and free from defects that may impair their strength and durability.

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. Use Delaware No. 57 Stone as backfill material meeting the following requirements, in addition to the gradation requirements specified in the Standard Specifications Section 813.

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:

Requirements	Test Methods
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 than or equal to 5000 ohm-cm, the chloride and sulfates requirements may be waived.

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.

Welded Wire Mesh. Welded wire mesh shall be shop-fabricated of cold drawn steel wire and conform to the requirements of AASHTO M32, has been welded into the finished mesh fabric in accordance with the requirements of AASHTO M55, and galvanization conforms to the minimum requirements of AASHTO M 111. Galvanization shall be applied after the mesh is fabricated.

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.

Excavation of Contaminated Material: Excavation, removal, and handling of any contaminated materials shall be completed in accordance with the requirements included in the Special Provision for Item 202560 – Contaminated Material.

Foundation Preparation. The foundation for the MSE wall structure from Sta.103+70.42 to Sta. 105+45.50 and Sta. 109+18.50 to Sta.109+80 requires subgrade stabilization, as indicated on the plans, consisting of driven H piles capped by an at grade beam and a pile footing. From Sta. 103+70.42 to Sta.105+05.00, a two (2) foot reinforced soil Bridging Layer (typically known as a load distribution platform) shall be placed continuously with the indicated backfill material and over the indicated grade beams. From Sta. 105+00.00 to Sta. 105+45.50 and Sta. 109+18.50 to Sta. 109+80.00, the driven H piles shall be capped

with a pile footing. Excavation for the bottom of both grade beams and pile footings within the indicated stations shall be to the extent indicated on the Plans. Prior to casting the specified grade beams or pile footing, the exposed subgrade shall be leveled with at least 3" of backfill material.

The foundation for the MSE wall structure from Sta. 109+80.00 to Sta. 110+93.67 shall consist of firm and unyielding existing soils. Any unsuitable foundation material, as determined by the Engineer, shall be excavated to the determined depth and replaced with Backfill material and shall be compacted in accordance with Backfill Placement as described below.

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 shall be placed closely following the erection of each course of soil reinforcement layer and spread by moving the machinery parallel to the wall face. Backfill shall be compacted by at least ten (10) passes of a heavy vibratory roller, weighting a minimum of 10 tons.

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.

The maximum lift thickness after compaction shall not exceed 8 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.

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. 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 will not be measured and will be incidental to the construction of the pertinent Retaining Wall.

All material excavated below existing site conditions within the limits of Sta. 103+70.42 to Sta. 105+45.50 and Sta. 109+18.50 to Sta. 110+93.67, shall be considered contaminated material. The quantity of excavated Contaminated Material will not be measured.

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 wired faced fascia.

Installation of driven H piles will be paid per linear foot of furnished and installed production piles as described under Sections 618.23 and 619.20 of the Standard Specifications.

Placement of concrete and steel reinforcement for the grade beams and pile footings will be paid as described under Sections 602.02 and 603.00 of the Standard Specifications.

Construction of the reinforced soil Bridging Layer will be paid as indicated under the Special Provision for Item 209503.

Excavation of unsuitable material within Sta. 109+80.00 to Sta. 110+93.67 will be paid for as described under Standard Specifications 207.07, Table 207-A and backfilling with suitable backfill material will be paid as described under Section 207.06 of the Standard Specifications.

The excavation and handling of contaminated material will not be paid for, but will be incidental to the Contract Lump Sum price for the pertinent Retaining Wall.

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

11/24/15

605581 - ELASTOMERIC BEARING PADS

Description:

This work consists of furnishing of all materials and necessary labor to fabricate, assemble, construct and install elastomeric bearing pads of the size(s) specified on the Plans, including sole plates, elastomeric bearing pads, steel shim plates, masonry plates, fabric bearing pads, anchor bolts, non-hardening caulking compound, elastic joint sealer, plate washers and heavy hex nuts as specified on the Plans and in accordance with these Specifications.

Materials:

The bearings shall conform to the requirements of Section 826 of the Standard Specifications, Section 18 of the 2004 AASHTO LRFD Bridge Construction Specifications including all interims and as specified on the Plans.

Construction Methods:

The bearings shall be stored under cover on a platform above the ground surface. The bearings shall be protected from damage at all times and when placed shall be dry, clean, free of dirt, oil, grease or other foreign substances.

The masonry plates shall be installed on single thickness preformed fabric bearing pads placed on surfaces conforming to the requirements of Subsection 602.17 of the Standard Specifications.

Anchor bolts shall be cast in place. A temporary casting template shall be used to ensure the anchor bolts are properly aligned and plumb.

The bearings shall be installed in accordance with the requirements of Section 605 of the Standard Specifications, Section 18 of the 2004 AASHTO LRFD Bridge Construction Specifications including all interims and as specified on the plans and herein.

Method of Measurement:

The quantity of elastomeric bearing pads will be measured as the actual number installed and accepted.

Basis of Payment:

The quantity of elastomeric bearing pads will be paid for at the Contract unit price bid per each. Price and payment will constitute full compensation for fabricating, assembling, furnishing, constructing and installing the bearings and for all materials, labor, tools, equipment and incidentals required to complete this work.

5/02/11

605758 - PREFABRICATED STEEL TRUSS BRIDGE

Description:

This item consists of the design, fabrication, supply, and erection of a prefabricated steel truss bridge as shown and described on the Plans, as directed by the Engineer, and as required by these Special Provisions.

Materials:

1. Structural Steel for Truss and Associated Members

   The proposed prefabricated steel truss bridge shall be fabricated from high strength, low alloy, atmospheric corrosion resistant ASTM A847 cold-formed welded square and rectangular tubing and/or ASTM A588, or ASTM A242, ASTM A606 plate and structural steel shapes (Fy = 50,000 psi). The minimum corrosion index of atmospheric corrosion resistant steel, as determined in accordance with ASTM G101, shall be 6.0.

2. Decking

   All decking shall be full thickness planks unless approved otherwise. Wood decking shall be naturally durable hardwood Ipe (Tabebuia Spp Lapacho Group). All planks shall be partially air dried to a moisture content of 20% or higher, and shall be supplied S4S (surfaced four sides), E4E (eased four edges), with the edges eased to a radius of 1/8". Measured at 25% moisture content, the width and thickness shall not vary from specified dimensions by more than ± 0.125" and ±0.0625", respectively. All planks shall be supplied with the end sealed with "Anchorseal" Mobil CER-M or an equal aquious wax log sealer. All planks shall be graded as FEQ (First Export Quality -) grading rules.

   All planks shall be naturally fire resistant without the use of any fire resistant preservatives to meet NFPA Class A and UBC Class I. Planks shall be supplied that meet or exceed the Static Coefficient of Friction for both Neolite and leather shoes in accordance with ASTM Test Method C1028-89.

   All planks shall meet or exceed the following mechanical properties (based on the 2" standard) as defined by the U.S. Forest Products Laboratory publications and testing data:

Bending Strength	22,475 psi
Modulus of Elasticity	3,145,000 psi
Max. Crush Strength	13,140 psi
Average air-dry density	56.7 to 59.3 pcf.
Basic specific gravity	0.85 - 0.97.
Janka side hardness	3,595 lbs at 12% moisture content

3. Steel and Hardware

   All hardware used to attach the hardwood ipe plank decking shall be 305 and 316 grade stainless steel screws.

4. Bearings

   Bridge bearings shall consist of a steel setting or slide plate placed on the abutment or grout pad. The bridge bearing plate which is welded to the bridge structure shall bear on this setting plate. One end of the bridge will be fixed by fully tightening the nuts on the anchor bolts at that end. The opposite end will have finger tight only nuts to allow movement under thermal expansion or contraction.

   The bridge bearings shall sit in a recessed pocket on the concrete pier. Minimum 28-day strength for the concrete shall be 4,500 PSI. The step height (from bottom of bearing to top-of-deck) shall be determined by the bridge manufacturer. Bearings shall have teflon on teflon or stainless steel on

teflon slide bearings placed between the bridge bearing plate and the setting plate. The top slide plate shall be large enough to cover the lower teflon slide surface at both temperature extremes.

Unless specified otherwise, the bridge manufacturer shall determine the number, diameter, minimum grade and finish of all anchor bolts. The anchor bolts shall be designed to resist all horizontal and uplift forces to be transferred by the superstructure to the supporting piers. Design of the supporting piers are shown on the Plans. The design of the anchor bolt embedments shall be the responsibility of the truss bridge supplier.

5. Handrails

Reference the Special Provisions elsewhere for requirements of the handrail system to be installed on the prefabricated steel truss bridge.

Design:

The prefabricated steel truss bridge shall be designed in accordance with applicable provisions of the Delaware Department of Transportation "Bridge Design Manual", latest edition and the AASHTO LRFD Bridge Design Specifications, latest edition, and the AASHTO LRFD Guide Specifications for the Design of Pedestrian Bridges, December 2009. The loading shall be 90 psf for pedestrian live load, or an H-10 (i.e., 10 ton) live load vehicle, whichever governs the design of each individual component of the prefabricated steel truss bridge. Dynamic loading need not be applied for either the pedestrian live load, or an H-10 (i.e., 10 ton) live load vehicle. The deflection of the bridge due to the unfactored pedestrian live load shall be less than 1/360 of the span length when investigated at the service limit state using load combination Service I in Table 3.4.1-1 of the AASHTO LRFD Bridge Design Specifications. Horizontal deflections under factored wind loading shall not exceed 1/360 of the span length.

The proposed prefabricated steel truss bridge shall be designed as a half-through pony truss, including one that has one (1) diagonal per panel and plumb end vertical members. Interior vertical members may be either plumb or perpendicular to the chord faces. The bridge shall be designed utilizing an underhung floor beam (top of floor beam welded to the bottom of the bottom chord) or be designed utilizing an H-Section configuration where the floor beams are placed up inside the trusses and attached to the truss verticals. The bridge manufacturer shall determine the distance from the top of the deck to the top and bottom truss members based upon structural and/or shipping requirements. The top of the top chord shall not be less than 54 inches above the deck when measured from the high point of the walking surface. All members of the vertical trusses (top and bottom chords, verticals, and diagonals) shall be fabricated from square and/or rectangular structural steel tubing. Other structural members and bracing shall be fabricated from structural steel shapes or square and rectangular structural steel tubing. Unless the floor and fastenings are specifically designed to provide adequate lateral support to the top flange of open shape stringers (w-shapes or channels), a minimum of one stiffener shall be provided in each stringer at every floor beam location.

The assumed truss bearing reactions are as shown on the Plans and include unfactored dead, live, wind on structure, and uniform temperature loads. If the Contractor's proposed truss reactions do not match those shown, the piers shall be revised accordingly by the Contractor to support those loads as required by his design. This may include a change in the size and detailing of the bearing seat and/or pier to support the proposed truss including a revision to the foundation design. Note that if a change in the size and detailing of any component of the pier is required, the geometric portions as specified on the Plans and elsewhere within these Special Provisions shall be maintained. In addition to the requirements stipulated herein, any change in the pier design or foundation design shall be detailed in the Contractor's shop drawings submittal. All changes shall be identified and he shall show all pertinent dimensions, reinforcement sizes, and reinforcement locations for approval by the Engineer. Similarly, changes in the foundation design shall also be similarly represented in the shop drawing submittal. All calculations shall be certified by a registered Professional Engineer licensed in the State of Delaware. This working drawing submittal shall be in conjunction with the submittal requirements stipulated elsewhere within these Special Provisions.

Minimum Thickness of Metal - The minimum thickness of all structural steel members shall be 3/16" nominal and be in accordance with the AISC Manual of Steel Constructions' "Standard Mill Practice Guidelines". For ASTM A500 and ASTM A847 tubing, the section properties used for design shall be per the Steel Tube Institute of North America's Hollow Structural Sections "Dimensions and Section Properties".

Welded Tubular Connections - All welded tubular connections shall be checked, when within applicable limits, for the limiting failure modes outlined in the ANSI/AWS D1.1 Structural Welding Code. When outside the "validity range" defined in these design guidelines, the following limit states or failure modes shall be checked:

- Chord face plastification
- Punching shear (through main member face)
- Material failure
    - Tension failure of the web member
    - Local buckling of a compression web member
- Weld failure
    - Allowable stress based on "effective lengths"
    - "Ultimate" capacity
- Local buckling of a main member face
- Main member failure:
    - Web or sidewall yielding
    - Web or sidewall crippling
    - Web or sidewall buckling
    - Overall shear failure

All tubular joints shall be plain unstiffened joints (made without the use of reinforcing plates) except as follows:

- Floor beams hung beneath the lower chord of the structure may be constructed with or without stiffener (or gusset) plates, as required by design.
- Floor beams which frame directly into the truss verticals (H-Section bridges) may be designed with or without end stiffening plates as required by design.
- Where chords, end floor beams and in high profiles the top end struts weld to the end verticals, the end verticals (or connections) may require stiffening to transfer the forces from these members into the end vertical.
- Truss vertical to chord connections.

The effects of fabrication tolerances shall be accounted for in the design of the structure. Special attention shall be given to the actual fit-up gap at welded truss joints.

Supplier:

Proposed suppliers must have at least five (5) years' experience designing and fabricating these type structures and a minimum of five (5) successful bridge projects, of similar construction, each of which has been in service at least three (3) years. List the location, bridge size, owner, and a contact for reference for each project.

Submittals:

Complete design computations and fabrication plans shall be submitted to the Engineer for review as a working drawing submittal per Subsection 105.04 and approved prior to fabricating any components of the prefabricated steel truss bridge. The design computations and plans shall be prepared by and stamped by a registered Professional Engineer licensed in the State of Delaware. The working drawings shall include, at a minimum, a general layout of the proposed structure, elevation and cross section, fabrication details for all steel members and steel assemblies and all splice locations and types of splice (butt splice, fascia plate splice, etc.). The working drawings shall include all pertinent dimensions, steel grades, drilled holes, fasteners, cambers, connectors, and an erection plan. Calculations shall be provided for each member and connection showing their conformance with the specified design criteria.

Calculations for the bridge superstructure shall be submitted by the bridge manufacturer and will be reviewed by the Engineer for approval. The calculations shall include all design information necessary to determine the structural adequacy of the bridge. Calculations shall conform to the AASHTO LRFD Bridge Design Specifications, latest edition, and shall include the following checks:

- All stress checks for axial, bending and shear forces in the critical member of each truss member type (i.e. top chord, bottom chord, floor beam, vertical, etc.).
- Checks for the critical connection failure modes for each truss member type (i.e. vertical, diagonal, floor beam, etc.). Special attention shall be given to all welded tube on tube connections.

- All bolted splice connections.
- Main truss deflection checks.
- U-Frame stiffness checks (used to determine K factors for out-of-plane buckling of the top chord) for all half through or "pony" truss bridges.

Fabrication:

Drain Holes - When the collection of water inside a structural tube is a possibility, either during construction or during service, the tube shall be provided with a drain hole at its lowest point to let water out.

Welds - Special attention shall be given to developing sufficient weld throats on tubular members. Fillet weld details shall be in accordance with AWS D1.1, Section 3.9. Unless determined otherwise by testing, the loss factor "Z" for heel welds shall be in accordance with AWS Table 2.8. Fillet welds which run onto the radius of a tube shall be built up to obtain the full throat thickness (See Figure 7.1). The maximum root openings of fillet welds shall not exceed 3/16" in conformance with AWS D1.1, Section 5.22. Weld size or effective throat dimensions shall be increased in accordance with this same section when applicable (i.e. fit-up gaps> 1/16").

Welding - Welding and weld procedure qualification tests shall conform to the provisions of ANSI/AWS D1.1 "Structural Welding Code", 1996 Edition. Filler metal shall be in accordance with the applicable AWS Filler Metal Specification (i.e. AWS A 5.28 for the GMAW Process). For exposed, bare, unpainted applications of corrosion resistant steels (i.e. ASTM A588 and A847), the filler metal shall be in accordance with AWS D1.1, Section 3.7.3.

Welders - Welders shall be properly accredited operators, each of whom shall submit certification of satisfactorily passing AWS standard qualification tests for all positions with unlimited thickness of base metal, have a minimum of 6 months experience in welding tubular structures and have demonstrated the ability to make uniform sound welds of the type required.

The fabricator shall have verified that the throat thickness of partial joint penetration groove welds (primarily matched edge welds or the flare-bevel-groove welds on underhung floor beams) shall be obtainable with their fit-up and weld procedures. Matched edge welds shall be "flushed" out when required to obtain the full throat or branch member wall thickness. For full penetration butt welds of tubular members, the backing material shall be fabricated prior to installation in the tube so as to be continuous around the full tube perimeter, including corners.

Backing may be of four types:

- A "box" welded up from four (4) plates.
- Two "channel" sections, bent to fit the inside radius of the tube, welded together with full penetration welds.
- A smaller tube section which slides inside the spliced tube.
- A solid plate cut to fit the inside radius of the tube.

Corners of the "box" backing, made from four plates, shall be welded and ground to match the inside corner radii of the chords. The solid plate option shall require a weep hole either in the chord wall above the "high side" of the plate or in the plate itself. In all types of backing, the minimum fit-up tolerances for backing must be maintained at the corners of the tubes as well as across the "flats".

Blast Cleaning shall be done in a dedicated OSHA approved indoor facility owned and operated by the bridge fabricator. Blast operations shall use Best Management Practices and exercise environmentally friendly blast media recovery systems. To aid in providing a uniformly "weathered" appearance, all exposed surfaces of steel shall be blast cleaned in accordance with Steel Structures Painting Council Surface Preparation Specifications No. 7 Brush-Off Blast Cleaning, SSPC-SP7 latest edition. Exposed surfaces of steel shall be defined as those surfaces seen from the deck and from outside of the structure. Stringers, floor beams, lower brace diagonals and the inside face of the truss below deck and bottom face of the bottom chord shall not be blasted.

Construction Methods:

All materials, equipment, processes of manufacture, and the finished sections, including handling, storage, and transportation, will be subject to inspection and approval by the Department. Any defective

construction, which may adversely affect the strength or performance of a section, shall be cause for rejection. Rejected sections shall be replaced at no additional expense to the Department.

Erection of the prefabricated steel truss bridge shall be completed in accordance with the erection plan shown on the approved shop drawings. Each structural member shall be set in the locations and elevations as noted on the erection drawings. The Contractor shall make all necessary provisions for erection loads and shall provide any necessary temporary bracing to maintain the bridge in a true and plumb configuration until erection is complete.

To install the deck, planks shall be placed tight together with no gaps. Every plank shall be attached with at least one fastener at each end. All fasteners shall be zinc plated. Self-tapping screws or hex-head bolts, with a steel plank hold down, are to be used at the ends of planks. Self-tapping screws or carriage bolts are to be used as interior connection fasteners when required. Power actuated fasteners shall not be used. Planks shall be drilled prior to installation of bolts and/or screws. At least one fastener shall be installed at each end of each plank. In addition, the contractor shall install, at every plank, at least two (2) fasteners located at a minimum of two interior stringer locations, approximately at the third points of the bridge width. Attachments at the ends of the planks may be modified as required if obstructions are present.

Warranty:

The bridge manufacturer shall warrant their steel structure(s) to be free of design, material and workmanship defects for a period of ten years from the date of delivery. Naturally durable hardwood decking and hardwood attachments shall carry a ten-year warranty against rot, termite damage, or fungal decay. Other types of wood are excepted under this warranty. This warranty shall not cover defects in the bridge caused by abuse, misuse, overloading, accident, improper maintenance, alteration or any other cause not the result of defective materials or workmanship. This warranty shall be void unless owner's records can be supplied which shall indicate compliance with the minimum guidelines specified in the inspection and maintenance procedures. Repair or replacement shall be the exclusive remedy for defects under this warranty. The bridge manufacturer shall not be liable for any consequential or incidental damages for breach of any express or implied warranty on their structures.

Method of Measurement:

The quantity of Prefabricated Steel Truss Bridge will not be measured.

Basis of Payment:

The quantity of Prefabricated Steel Truss Bridge will be paid for at the Contract lump sum price for item 605758. Price and payment will constitute full compensation for furnishing all materials related to the prefabricated units; designing, preparing shop drawings, fabricating and erecting the units on site, and for all labor, tools, and equipment and necessary incidentals to complete the work. The cost of any splices of the Prefabricated Steel Truss required for erection, or any temporary structures required to erect and /or support individual segments of the truss during erection will be incidental to item 605758. Price and payment will also constitute full compensation for all materials, labor, tools, equipment and incidentals necessary to construct structures associated with the Prefabricated Steel Truss including bearings, decking, railings, etc. as specified on the Plans. If the pier design and detailing is revised by the Contractor, costs associated with this revision, including preparing the design calculations and any increase in material will be incidental to the Contract lump sum price for Item 605758.

11/09/2015

606701 - GALVANIZED STEEL WOVEN WIRE MESH INFILL PANEL RAILING

Description:

This work includes furnishing, fabricating, and delivering to the project site all components necessary to construct a galvanized steel woven wire mesh infill panel railing with stainless steel posts, rails, and spacers and a galvanized steel woven wire mesh infill panel as indicated on the Plans, these Special Provisions and as may be directed by the Engineer. Installation and erection of the entire railing system is also included under this item.

This work shall also include furnishing and installing all hardware required for erection and assembly of the railing in conformance with the requirements of the Plans and these Special Provisions.

Materials:

Material specified for the structural elements of the railing system, including top and bottom tube rails, rail posts, and rail connection plates shall meet the requirements of AISI 316 Stainless Steel. The woven wire mesh inset panel shall consist of 8 gauge wire material meeting the requirements of ASTM A 853 and galvanized in accordance with A 123.

Bolts shall conform to A 307, unless otherwise noted. All bolts and nuts (except dome-head bolts) shall have washers. Dome-head bolts need not have washers under the head, unless otherwise noted. Plates and washers shall be A 709, Grade 36 steel. Bolts, nuts, washers and plates shall be galvanized in conformance with ASTM A 153.

Construction Methods:

The railing system shall be constructed in accordance with the fabricators recommendations and applicable portions of Section 606 of the Standard Specifications.

Method of Measurement:

The item will not be measured for payment. The quantity of Galvanized Steel Woven Wire Mesh Infill Panel Railing will be measured by the linear foot. The quantity will be determined from the actual length of the finished railing system completed and accepted.

Basis of Payment:

The item Galvanized Steel Woven Wire Mesh Infill Panel Railing will be paid for at the Contract unit price bid per linear foot, which price and payment will constitute full compensation for furnishing, fabricating, and installing all materials; for touch up of damaged coatings; and for all labor, equipment, tools, and incidentals required to complete the work.

08/11/2015

606702 - STAINLESS STEEL CABLE RAILING

Description:

This work includes furnishing, fabricating, treating and delivering to the project site all components necessary to construct a stainless steel cable railing with timber posts, handrails, and rails as indicated on the Plans, these Special Provisions and as may be directed by the Engineer. Installation and erection of the entire railing system is also included under this item.

This work shall also include furnishing and installing all hardware (anchor bolts, machine bolts, carriage bolts, drift bolts, lag screws, dowels, tie rods, nails, spikes, washers, connectors, plates etc.), required for erection and assembly of the railing in conformance with the requirements of the Plans and these Special Provisions.

Materials:

Timber material specified for the structural elements of the railing system, including hand rails, posts and rails, shall meet the requirements specified under Subsections 601.02 and 601.03 as applicable. All dimensions shown on the Plans for timber and lumber are nominal dimensions, except where noted otherwise.

Structural lumber shall bear the grademark, stamp or other identifying marks indicating grades of material and rules or standards under which produced. These identifying marks on a material shall conform to the rule or standard under which the material is produced, including requirements for qualifications and authority of the inspection organization, usage of authorized identification and information included in the identification. The inspection agency for lumber shall be certified by the Board of Review, American Lumber Standards Committee, to the grade of species used.

Moisture content for lumber shall range from 12 to 15 percent.

All timber members shall be treated with copper naphthenate preservative to a minimum net retention of 0.04 pcf in accordance with the American Wood Protection Association's (AWPA) U1-14 User Specification for Treated Wood and T1-14 Processing and Treatment Standard. The manufacturer shall supply a certificate that each timber member used to construct the railing system has been properly treated in accordance with this Special Provision and the requirements of AWPA UC3. Any field cuts and/or bores shall be treated with copper naphthenate preservative per AWPA M4. All pressure treated material shall be steam cleaned after treatment. A certificate of treatment from a certified AWPA facility shall be submitted.

Stainless steel cable shall meet Federal Specification RR-W-410, Type I, General Purpose, Class 2, 6 by 19, improved plow steel, fiber core. Corrosion-resistant steel wire ropes shall be made of wires of 302 or 304 composition as specified in SAE AIR4127.

Bolts shall conform to A 325, unless otherwise noted. All bolts and nuts (except dome-head bolts) shall have washers. Dome-head bolts need not have washers under the head, unless otherwise noted. All plates and washers shall be A 709, Grade 36 steel. Bolts, nuts, washers and plates shall be galvanized in conformance with ASTM A 153.

Tie rods and threaded rods shall conform to A 307 and shall be galvanized in conformance with ASTM A 153.

Timber and hardware shall conform to the requirements of Section 601 of the Standard Specifications.

All posts, rails, and handrails shall be Southern Pine, Select Structural Grade, in accordance with National Design Specification Supplement, by the National Forest Products Association, latest edition.

Construction Methods:

The railing system shall be constructed in accordance with the fabricators recommendations and applicable portions of Section 601 of the Standard Specifications.

Method of Measurement:

The item will not be measured for payment. The quantity of Stainless Steel Cable Railing will be measured by the linear foot. The quantity will be determined from the actual length of the finished railing system completed and accepted.

Basis of Payment:

The item Stainless Steel Cable Railing will be paid for at the Contract unit price bid per linear foot, which price and payment shall constitute full compensation for furnishing, fabricating, and installing all materials and for all labor, equipment, tools, and incidentals required to complete the work.

08/11/2015

606703 - STAINLESS STEEL RAILING

Description:

This work includes furnishing, fabricating, and delivering to the project site all components necessary to construct a stainless steel post railing with stainless steel handrails and a stainless steel coil wire mesh inset panel as indicated on the Plans, these Special Provisions and as may be directed by the Engineer. Installation and erection of the entire railing system is also included under this item.

This work shall also include furnishing and installing all hardware and connecting plates required for erection and assembly of the railing in conformance with the requirements of the Plans and these Special Provisions.

Materials:

Material specified for the structural elements of the railing system, including tube rails, stanchion plates, and pipe rails for the inset panel shall meet the requirements of AISI 316 Stainless Steel. The coil wire mesh inset panel shall consist of the following materials meeting the requirements of AISI 316 Stainless Steel:

3/8" diameter, 16 gauge wire mesh
3/16" diameter steel rod edge inserts with ¼" diameter welded eye bolts
3/16", 7x9 top/bottom tensioning edge cable

Bolts, nuts, and washers shall be stainless steel conforming to A 193 B8 Class 2, unless otherwise noted. All bolts and nuts (except dome-head bolts) shall have washers. Dome-head bolts need not have washers under the head, unless otherwise noted.

Construction Methods:

The railing system shall be constructed in accordance with the fabricator's recommendations and applicable portions of Section 606 of the Standard Specifications. Working drawings displaying the fabrication, layout, and construction of the railing system shall be submitted for review and approval by the engineer.

Method of Measurement:

The quantity of Stainless Steel Railing will be measured by the linear foot. The quantity will be determined from the actual length of the finished railing system completed and accepted.

Basis of Payment:

The item Stainless Steel Railing will be paid for at the Contract unit price bid per linear foot, which price and payment will constitute full compensation for furnishing, fabricating, and installing all materials; and for all labor, equipment, tools, and incidentals required to complete the work.

08/11/2015

618535 - STEEL H PILES, HP 14 X 89
618536 - STEEL H TEST PILES, HP 14 X 89

Description:

This item consists of furnishing Steel H pile and test piles, as shown and described on the Plans, as directed by the Engineer, and as required by these Special Provisions.

Materials:

Unless otherwise indicated, all steel H piles shall conform to the requirements of AASHTO M 183/M 183M. Materials for splices or reinforced tips shall be the same as the H pile except that cast steel may be used for tips. All welding and welding materials shall be as specified under Subsection 826.12. Steel shall be straight and true with the camber and sweep within the permissible mill tolerances.

Construction Methods:

Not applicable.

Method of Measurement:

The quantity of steel H piles will be field measured as the total number of linear feet of material ordered as determined by the Department based on test pile driving. The quantity of steel H test piles will be field measured as the total number of linear feet ordered by the Contractor after approval by the Engineer for each test pile. The quantity of pile material used in pile splices will be field measured as the total number of linear feet of material furnished to the site as agreed by the Department. Pay measurements will be taken, in every case, before actual driving has begun.

Basis of Payment:

The quantity of steel H piles will be paid for at the Contract unit price per linear foot. The quantity of steel H test piles will be paid for at the Contract unit price per linear foot (linear meter) for each test pile. The quantity of pile material used for pile splices will be paid for at the Contract unit price per linear foot of steel H pile.

Price and payment will constitute full compensation for furnishing all pile and test pile materials, including pile tips and for all labor, equipment, tools, and incidentals required to complete the work. All piles that are damaged due to improper storage or handling by the Contractor shall be replaced by the Contractor at no expense to the Department. No payment will be made for production piles and test piles not accepted, production piles and test piles improperly driven, or production piles and test piles damaged during driving.

08/12/2015

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.

As directed by the Engineer, up to ten production piles driven shall be subject to pile restrikes. The Engineer will specify a waiting time of five days or less to perform the pile restrikes, unless noted otherwise on the Plans.

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 piles 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 additional restrikes of selected production piles beyond the first ten restrikes ordered by the Engineer.

The Engineer will work jointly with the Contractor to establish a sequencing of all 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" performed beyond the first ten restrikes order by the Engineer 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) unit 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.

8/11/15

619519 - HIGH-STRAIN 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 provide the following submittal documents, considered herein as **PRECONSTRUCTION DOCUMENTS**, to the Department at least 10 days prior to the Pre-Construction meeting for approval:

a. **Shop Drawings:**

Indicate pile layout details, member size and splicer fittings and pile tip detail. Use standard welding symbols of the American Welding Society on shop drawings.

b. **List of Personnel:**

List of names from personnel assigned to the project, including project superintendent. Include direct contact information, such as phone (cell) number and email address for the project superintendent.

c. **Name of Dynamic Testing Consultant (DTC):**

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 Engineer. The Contractor shall provide the necessary contact information of the selected DTC. The DCT shall have taken the Dynamic Measurements and Analysis Proficiency Test from PDI, Inc. /PDCA or Foundation QA and passed with a grade of at least Advance rank. In addition, the DTC 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 and closed ended pipe piles.

The DTC may utilize a field technician or staff engineer to operate the instrumentation and collect the data having a Basic level Certificate of Proficiency only when under the direct supervision of a senior engineer with at least an Advance level Certificate of Proficiency. This person 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 by the DTC and DTC field engineer or technician, shall include the client and owner, points of contact, and a description of the pile type.

d. **Qualifications:**

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, including the respective Certificate of Proficiency for Dynamic

Measurements and Analysis for each personnel involved with the Dynamic Pile Testing. 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.

e. **Pile Installation Plan (PIP):**

In addition to the Pile and Pile Driving Equipment Data sheet, the Contractor shall provide the following information:

1. List and size of proposed equipment, including cranes, barges, driving equipment (i.e., pile hammer, leads), jetting equipment, compressors, and pre-auger equipment (if necessary). Include manufacture's data sheets on hammers, and results from wave equation analysis, such as output bearing plots and tables from WEAP programs, performed by DTC to select the proposed hammer and determine an initial safe blow count criteria for the installation of each pile type. All raw data and computer analyses shall also be provided in electronic format to the Department for additional analysis.

2. Methods to determine hammer energy and stroke in the field for determination of pile capacity (resistance). Include in the submittal necessary charts and recent calibrations for any pressure and/or strain measuring devise, type of Pile Driving Analyzer (PDA), and saximeter.

3. Detailed drawings of any proposed followers.

4. Detailed drawings of templates. The Contractor is required to utilize a fixed template to install piles to the specified alignment and location. Pile driver leads used as a frame to support the hammer shall not be considered as meeting this requirement.

5. Proposed schedule for test pile program and production pile driving.

6. Proposed pile splice locations and details of any proprietary splices anticipated to be used.

7. Layout drawings indicating proposed sequence of driving of the piles. On this sequential layout, indicate each pile identification, its driving sequence number, type, and size.

8. Required shop drawings for cofferdams.

9. Methods to prevent deflection of battered piles due to their own weight and to maintain their as-driven position until casting of the pile cap is complete.

Acceptance of all equipment and procedures specified included in the PIP by the Contractor is subject to satisfactory field performance. The Contractor shall notify the Department of any modifications to the proposed equipment and procedures prior to implementation.

f. **Method of Splicing**:

Qualify the proposed method of splicing and submit qualifications of workmen performing pile splicing operations.

Employ a certified, independent testing agency to conduct testing in accordance with ANSI/AWS D1.5. Certify the work of the testing agency and document it for ready reference.

The Contractor shall provide the following submittal documents, considered herein as **CONSTRUCTION DOCUMENTS**, to the Department as specified below:

a. **Mill Certification:**

Provide mill certifications for all piles delivered to the site, verifying the steel designation and yield strength of the steel as specified in the plans.

b. **Pile Length and Driving Criteria Letters:**

The DTC is to recommend a production pile length(s) and develop the driving (installation) criteria for the production piles based on the results of the wave equation analysis and high strain dynamic testing with signal matching analysis as indicated on the plans. The DTC shall submit the recommended pile length and driving criteria for review and approval by the Engineer prior to installation of production piles. The driving criteria letter shall be specific in detail on how production piles will be installed. When a high strain dynamic test is performed, the driving criteria letter shall also include a summary of the test pile driving record from the PDA and inspection log, a signal matching analysis performed for a representative blow used to set up the criteria based on the driving the pile to the required nominal resistance or a percent, and a refined pile wave equation analysis showing the blows and stroke required to achieve the target resistance. These letters can be submitted on the Engineer in the form of an email, with the necessary attachments. The letters must be appended to the Dynamic Test Report described in in section B.3.

The Engineer will review the recommended driving criteria and notify the DTC and Contractor of its approval or rejection within 2 days from receipt of the recommendations.

The Engineer may allow the Contractor to install production piles to the minimum penetration elevation specified on the plans at each substructure unit at a safe blow count (penetration rate) demonstrated by wave equation analysis performed by the DTC where dynamic testing is specified and only when approved by the Engineer in advance. Each pile driven in this manner will require a dynamic test to confirm nominal resistance and pile integrity. The Contractor shall bare all the cost associated with the required dynamic testing and required analysis by the DTC.

c. **Dynamic Test Report:**

The DTC shall prepare a written report presenting the results of the pile installation 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 where dynamic testing is specified. The report shall also include the results of all wave equation analysis performed to establish driving criterions. 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. As a reference, consider a representative blow as that recorded within a 12 inch penetration with less than 0.25 inches (averaged) in rebound.

Within three (3) working days of the completion of each dynamic test, the DTC shall submit to the Engineer 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 Engineer.

The DTC is allowed to develop individual driving criteria for each substructure unit containing a test pile following the completion of the dynamic test. Each substructure will then require a separate submittal of a Dynamic Load Test Report, Length and Driving Criteria Letters.

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) and other submittals indicated herein. It also includes up to two additional instrumented restrikes ordered within 48 hrs after initial drive by the Engineer per Standard Specifications Section 619.11.

Basis of Payment:

Payment for High-Strain Dynamic Pile Testing with Signal Matching Analysis by Contractor authorized and found acceptable by the Department will be made at the Contract unit price per Each for Item 619519. The payment will also be full compensation for preparing the preconstruction wave equation analyses where test piles are specified on the plans, and preparation of reports and all related submittals described herein.

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.

11/24/15

619520 - DRILLED MICROPILES
619560 - MICROPILE PROOF LOAD TEST

Description:

This work pertains to geotechnical and structural design and furnishing all materials for and installation of micropiles to support the Boardwalk Structure and any temporary bridge structure required for site mobility and utility crossing in accordance with the Drawings and these specifications, including the installation of all necessary mechanisms to connect micropiles to the supported structure. Each micropile shall be installed at the location and to the elevation, minimum length, and installation torque indicative of the design allowable capacities shown on the Plans or as established by the Contractor and approved by the Engineer. In addition, micropiles shall be load tested as specified herein.

The Contractor shall select the micropile type, size, installation means and methods, and means and methods of connecting the micropile to the supported structure. The Contractor shall perform all geotechnical and structural design. Pile proof load testing shall be performed at a frequency of at least one per every 100' of trail structure alignment where helical piles are proposed by the Contractor. The micropiles shall be designed with a minimum Factor of Safety equal to 2.0 for bearing capacity. For micropiles subject to tensile forces (uplift), the maximum design capacity shall not exceed 1/3 of the ultimate side frictional resistance determined from static analysis methods or 50% of the failure uplift load determined from tension (pullout) static load tests. Lateral capacities of the micropiles shall be determined based on the tolerable differential movements between adjacent piers producing stresses on the structural timber or selected equivalent structural component below the allowable material structural strength indicated on the Plans.

The Contractor shall determine the number and layout of piles necessary to support the proposed Boardwalk Structure at each pier location according to the required design allowable capacities and load test results. Any changes to the pile layout as a result of unexpected outcome from the load tests shall be submitted to the Engineer for review. No additional time or compensation will be allowed.

Additional soil borings, test piles or other in-situ tests may be conducted as part of the construction, if the Contractor deems that more soil information is required. The cost of additional subsurface data collection will be incidental to the cost of this item.

All drilled micropiles shall be constructed using a full pile length casing to remain in place until the pile is grouted.

Submittals

A. At least 7 days prior to the preconstruction meeting, verification of the following requirements and documents shall be submitted by the Contractor to the Engineer for review and approval:

1. Qualifications
   The Contractor shall submit the completed project reference list and personnel. The project reference list shall include a brief project description with the owner's name and current phone number. The personnel list shall identify the micropile design engineer, supervising geotechnical project engineer, personnel who will install the micropiles and the on-site foremen to be assigned to the project. The personnel list shall contain a summary of each individual's experience and be complete for the Engineer to determine whether each individual satisfies the following required qualifications:

   a. The micropile specialty contractor shall be experienced in the design, construction and load testing of micropiles and have successfully constructed at least three (3) projects in the last five (5) years involving construction of micropiles. The projects should involve the construction and load testing of micropiles of similar scope, foundation loads, access and subsurface conditions to this project. The micropile specialty contractor shall submit construction details, structural details and load test results for at least three (3) previous successful experiences of micropile load tests from different projects of similar scope to this project. Must have available and be thoroughly familiar with the specialized type of

equipment needed to perform work of this type. A list of the equipment and resources it plans to mobilize for the performance of the project shall be submitted prior to beginning any construction operations.

b. The micropile specialty contractor shall supply a geotechnical project engineer to supervise the work with experience on at least three (3) projects of similar scope to this project completed over the past five (5) years. The Contractor shall not use consultants or manufacturers' representatives to satisfy these supervising geotechnical engineer requirements.

c. The on-site foremen and drill rig operators shall also have experience on at least three (3) projects over the past five (5) years installing micropiles of equal or greater resistances as required in these Contract Documents, or as determined by the micropile design engineer.

d. The micropiles shall be designed by a Professional Engineer licensed in the State of Delaware and with experience in the design of at least three (3) successfully completed micropile foundation projects over the past five (5) years. The micropile design engineer may be an employee of the Contractor or a separate Consultant designer.

The Engineer may require the Contractor to acquire the services of an Independent Testing Agency (ITA) to manage the load testing of micropiles. When required, the ITA shall provide a full time field engineer to install instrumentation onto the pile foundation, record all load test data, sample and test grout cubes and develop a summary report for each load test of the obtained load test results accompanied with a signed and sealed certification letter. The ITA's field engineer or supervisor shall be a Professional Engineer licensed in the State of Delaware, with demonstrated record of experience in foundation load testing with at least three (3) successfully completed micropile foundation load testing in the past five (5) years. A copy of the ITA engineers' resumes shall be submitted to the Engineer for review and approval.

The Engineer will determine the Contractor's acceptability within 15 calendar days after receipt of a complete submission. Additional time required due to incomplete or unacceptable submittals shall not be cause for a time extension or impact or delay claims.

B. Prior to the commencement of construction, the Contractor shall submit to the Engineer the following documents for review and acceptance:

1. Design/Working Drawings Submittal
   a. The Contractor shall submit complete design calculations and Working Drawings for review and approval. The drawings and calculations shall be signed and sealed by the Contractor's micropile design engineer, who shall be a Professional Engineer licensed in the State of Delaware.

   b. The design calculations shall include, but not be limited to, the following:
      1. Written summary describing the overall micropile pile design, following FHWA publication FHWA-NHI-05-039 "*Micropile Design and Construction"* Reference Manual.
      2. Micropile critical design cross section including the provision for corrosion, soil strata and magnitude and direction of design applied loadings;
      3. Design criteria including, including soil and rock bond or adhesion values, micropile dimensions assumed and structural strength estimated.
      4. Design calculation sheets with the project number, micropile structural location, designation, date of preparation, initials of designer and checker and page number at the top of each page.
      5. Design notes including an explanation of any symbols and computer programs used in the design. If a computer program is used for design, provide a hand calculation of at least one computer based calculation for verification;
      6. All required structural calculations including critical design typical sections, and pile to cap connection. Details currently shown on the Plans shall be evaluated by the Contractor based on their pile system, and modified accordingly.

         All details shall be submitted for approval. No additional compensation shall be given to modify the current details.

c. Provide shop drawings indicating product components and accessories and indicating the following:
   1. Micropile number.
   2. Location and pattern by assigned identification number.
   3. Micropile design load.
   4. Diameter size and wall thickness of casing
   5. Steel reinforcement bar diameter, total length and splice detail.
   6. Minimum casing (or cased) length of micropile.
   7. Minimum bond zone (or uncased) length
   8. Inclination of micropiles piles (when needed);
   9. Grout minimum strength.
   10. Cutoff elevation.
   11. Detail showing the micropile to cap attachment or connection.

d. Plan showing micropile layout per pier, and identifying the planned pile proof load test sites per specified load testing frequency.
e. General notes for constructing and installing the micropile foundation including construction sequencing.
f. Contingency plans (or plan of action) should refusal or obstructions be encountered.

2. Construction Submittal

The Contractor shall prepare and submit for review and approval a detailed step-by-step description of the proposed micropile installation and load testing procedure, including personnel and equipment to assure quality control. This step-by-step procedure shall be indicated on the working drawings in sufficient detail to allow the Engineer to monitor construction quality, which should include as a minimum the following:

a. Method to install piles, including drilling the holes, advancing the casing, supporting the bond zone, flushing drilled holes, installing reinforcement, and containment and disposal of water and spoils.
b. Method and equipment for grouting piles.
c. Signed and sealed design calculations for the pile and reaction frame system by a Professional Engineer licensed in the State of Delaware.

3. Quality Assurance/Control Submittal
   a. Certified mill test reports for the reinforcing steel bar.
   b. Coupon test results for permanent casing.
   c. Grout mix design and minimum compressive strength.
   d. Calibration reports for load test cell jack.
   e. Calibration reports for pile load test instrumentation (i.e., strain gauges if used)
   f. Proposed construction QA/QC methods or procedures for:
      1. Monitoring grout volumes
      2. Sampling and testing grout cubes to confirm compressive strength of mix, including frequency and selected certified laboratory for compressive strength testing of grout cubes (only if ITA is not requested by the Engineer);
      3. Containing drilling spoils, fluids and grout during construction within the limits of disturbance shown on the Plan.

C. During construction, the Contractor shall provide copies of all inspection logs of each installed micropile within 24 hrs of completion. The records for each completed pile installation shall include:

1. Pile designation number and date of installation.
2. Top of pile elevation immediately after installation.
3. Tip elevation as installed.
4. Deviation from specified working drawing location in inches to the nearest ½ inch.
5. Pile length immediately after installation to the nearest 0.1 foot.
6. Bottom elevation of drill casing upon completion of drilling and bottom elevation of steel core reinforcing.

7. Description of any deviations from the design location and batter or from the approved pile design and installation procedures, and description of any unusual occurrences during drilling, installation and grouting after notifying the Engineer
8. Description of soil cuttings.
9. Grout volumes.
10. Inclinations of the drilled battered pile installed.

D. Within thirty (30) days after completion of all required work for installing the proposed micropiles, the Contractor shall submit the following documents:
1. Signed and sealed as-built drawings showing the locations and top and bottom elevations of all installed micropiles. Plans shall be signed and sealed by the micropile design engineer and supervising geotechnical project engineer, and shall be accompanied with a certification letter, also signed and sealed by the two (2) engineers indicated herein, that all micropiles were installed in accordance the approved working drawing and design calculations. The installation record of each micropile shall be appended to the certification letter.
2. Signed and sealed load test site records.
3. Revised design calculations signed by the approved licensed Professional Engineer for all design changes made during the construction and load testing of the micropiles.

Materials:

All materials furnished for the micropiles shall be new and without defects. Defective materials shall be removed from the jobsite at no additional cost to the Department. Additional requirements are presented below. A 0.125 inch section loss per face shall be considered on all steel sections above the minimum pile tip elevation shown on the plans to account for corrosion.

1. Cement Grout - The cement grout shall consist of a mixture of Portland cement and water so proportioned and mixed as to provide a fluid grout capable of maintaining the solids in suspension without appreciable bleed. The materials shall be so proportioned as to provide a hardened grout having a minimum ultimate compressive strength of 4,000 psi at 28 days in accordance with ASTM C109.

   Cement shall conform to ASTM C150 Portland Cement Type I / II.

   Mixing water for cement grout shall conform to AASHTO T 26 and shall be potable, clean, and free from substances that may be injurious to cement and steel.

   Admixtures shall conform to ASTM C 494.

   Fine Aggregate: If sand – cement grout is used, sand shall conform to ASTM C 144.

2. Reinforcing Steel Bars - Reinforcing steel shall be deformed bars conforming to A 615 Grade 75 or A706 Grade 80. When a bearing plate and nut are required to be threaded onto the top end of reinforcing bars for the pile top to footing anchorage, the threading may be continuous spiral deformed ribbing provided by the bar deformations or may be cut into a reinforcing bar. If threads are cut into a reinforcing bar, the next larger bar number designation from that considered on the approved working drawing at no additional cost to the Department.

   If bar tendon couplers are required, they shall develop the ultimate tensile strength of the bars without evidence of any failure.

3. Permanent Steel Casing - Permanent steel casing shall consist of spiral welded or seamless steel casing of at least 0.5 inch thick, with equivalent capacity to transfer design loads at the casing joints. Joints between sections must be threaded. As installed, there shall be no joints within three feet of the bottom of the pile cap. Steel casing shall meet the requirements of the ASTM A501, API N-80, or alternative material approved by the Engineer.

   For permanent casing/pipe that will be shop welded, the following material conditions apply:

   a. The carbon equivalency (CE) as defined in AWS D1.1, Section X15.1, shall not exceed 0.45, as demonstrated by mill certifications.

b. The sulfur content shall not exceed 0.05%, as demonstrated by mill certifications.

For permanent casing/pipe that will be shop welded, the following fabrication or construction conditions apply:

a. The steel pipe shall not be joined by welded lap splicing
b. Welded seams and splices shall be complete penetration welds
c. Partial penetration welds may be restored in conformance with AWS D1.1
d. The proposed welding procedure certified by a welding specialist shall be submitted for approval

Threaded casing joints shall develop at least the required nominal resistance used in the design of the micropile.

4. Centralizers and Spacers - Centralizers and spacers shall be fabricated from schedule 40 PVC pipe or tube, steel, or material non-detrimental to the reinforcing steel. Wood shall not be used. Centralizers and spacers shall be securely attached to the reinforcement; sized to position the reinforcement within 1/2-inch of plan location from center of pile; sized to allow grout tremie pipe insertion to the bottom of the drillhole; and sized to allow grout to freely flow up the drillhole and casing and between adjacent reinforcing bars.

5. Epoxy Coating - The minimum thickness of coating applied electrostatically to the reinforcing steel shall be 0.3 mm. Epoxy coating shall be in accordance with ASTM A775 or ASTM A934. Bend test requirements are waived. Bearing plates and nuts encased in the pile concrete footing need not be epoxy coated.

6. Encapsulation – If selected for use, encapsulation (double corrosion protection) shall be shop fabricated using high-density, corrugated polyethylene tubing conforming to the requirements of ASTM D3350 with a nominal wall thickness of 0.8 mm. The inside annulus between the reinforcing bars and the encapsulating tube shall be a minimum of 5 mm and be fully grouted with non-shrink grout conforming to this specification.

7. Sheathing - Smooth plastic sheathing, including joints, shall be watertight. Polyvinyl chloride (PVC) sheathing shall conform to ASTM D 1784, Class 13464-B.

Construction Methods:

The following minimum procedures shall be performed.

Work shall not start, nor materials ordered until the Engineer's approval of the Contractor's experience qualifications is given. The Engineer may suspend work if the Contractor uses non-approved personnel. If work is suspended, the Contractor shall be fully liable for all resulting costs and no adjustment in contract time or cost will result from the suspension.

All micropile materials shall be handled and transported carefully to prevent any deformation or damage. Care should be taken to prevent the accumulation of dirt, mud or other foreign matter on the steel materials, such accumulation shall be completely removed prior to installation.

The Contractor shall provide the Engineer free and safe access to the work areas at all times. The Contractor shall furnish the Engineer or his authorized representative with unrestricted access as reasonable to observe and document the work.

1. General
   a. Do not deviate from the approved sequence of construction and listed construction equipment, unless prior approval is given by the Engineer, in concurrence with the supervising geotechnical project engineer and micropile design engineer.
   b. Verify that site conditions are acceptable and installation of micropiles are in accordance with all pertinent codes and regulations regarding such items and underground obstructions, right-of-way limitations, utilities, etc.

2. Installation
   a. All micropiles shall be drill casing to the proposed depth of the bottom of the pile. Water alone shall not be used as fluid for the drilling operation. Handle and dispose of cuttings in a manner that is approved by the Engineer.
   b. The hole shall be grouted within 1 hour. In case of delay, the hole shall be re-flushed and re-checked prior to grouting as directed by the Engineer. The core steel shall be lowered into the pile before or after grouting. A positive displacement grout pump shall be used. The grout pump shall be calibrated on site by pumping into an approved container of at least 50 gallons no more than one week prior to installing the piles.
   c. The micropile casing shall be extracted to develop a bonded zone only after grout has been placed in the micropile through a tremie pipe or full length pump line.
   d. Use centralizers at spacing no greater than 10-ft to install and center the core steel in the drill hole. Provide adequate development length for each bar into the pile cap.
   e. Install the micropiles to the following allowable tolerances, unless stricter tolerances are required per the micropile design engineer:
      1. Centerline of piling shall not be more than 3-inches from indicated plan location.
      2. Pile shall be plumb within 2 percent of total-length plan alignment.
      3. Top elevation of pile shall be plus 1-inch or minus 2-inches maximum from vertical elevation indicated on the approved working drawing.
      4. Centerline of reinforcing steel shall not be more than 5/8-inch from indicated location.
   f. Piles that are damaged or defective due to defective materials, improper installation procedure, or improper welding of steel reinforcing, or piles that have an installed volume of cement grout placed not exceeding a volume equal to 125% of the theoretical volume of the portion of the drill hole in soil and bedrock, will not be accepted.

3. Drilled Micropile Proof Load Test
   a. Perform a minimum of one micropile proof load test every 100’ of trail structure alignment in which micropiles are proposed to support the Boardwalk Structure in either tension or compression loading, with at least one third (1/3) of the total number of tests to be performed under compression loading.
   b. Perform the compression test in accordance with ASTM D-1143 and the tension test per ASTM D3689. Each load tests shall be conducted, the results evaluated, reviewed and accepted by the Engineer prior to installing additional production piles on additional piers.
   c. Submit to the Engineer the details of the proposed load test set-up and all equipment and measurement systems to be used for the test, and obtain approval from the Engineer before any load test is made. All load tests shall be observed by the Engineer or authorized representative.
   d. Apply the load to the pile core by means of a single hydraulic jack. Construct the apparatus for applying the loads to the test pile so that the loads are applied axially to the pile. Calibrate the test load jacking system including the hydraulic jack, and pressure gauge prior to the test so that the load applied is controlled to within 5 percent of the total applied load. Submit calibration reports to the Engineer prior to the start of the pile load test. Calibration tests shall be performed within 90 days of the date of the load test.
   e. Provide all necessary materials and labor for construction of a settlement measuring system for each test, as follows:

      1. Provide an independent reference beam for load test measurement apparatus support. The reference beam must be independently supported with supports firmly embedded in the ground at a distance at least 8 feet from the test pile and reaction piles. One end of the reference beam must be free to move as the length of the beam changes with temperature variations.
      2. Mount a minimum of three dial gauges equidistant from the center of the test pile and at 120-degree intervals around the pile. Attach the dial gauges rigidly to the reference beam. Align gauge stems vertically and provide smooth horizontal bearing surfaces for the gauge stems. Dial gauges shall have at least 2-inch travel and shall read to 0.001 inch.
      3. Establish a reference point on the test pile and at each end or the center of the reference beam. The reference points shall consist of graduated scales machine-divided into 0.02-inch and attached securely to the pile and reference beam. The reference points shall be monitored using survey equipment during the pile load test.
      4. Protect the settlement measuring system against rain, wind, frost, and any other disturbances that could affect the reliability of the settlement observations. Provide sunshading for the

measuring system for the duration of the test and for a minimum of 1-hour prior to the start of the test.

f. Submit a detailed report including such information as pile location, type, diameter, length, settlement readings, and all other pertinent data as indicated in ASTM D-1143 for compression load tests or ASTM D3689 for tensile load tests. Each load test report shall be accompanied by a signed and sealed certification letter by the supervising geotechnical project engineer or ITA's engineer responsible for the load tests (when requested by the Department). The following information shall be included as a minimum:
   1. Name of project and Contractor.
   2. Name of Contractor's supervisor during installation.
   3. Name of third party test agency, if applicable.
   4. Date, time and duration of test.
   5. Location of micropiles assigned identification number.
   6. Type of test (tension or compression).
   7. Description of calibrated testing equipment and test setup.
   8. Actual micropile pile type and configuration, including lead section, number and type of extension sections.
   9. Steps and duration of each load increment.
   10. Cumulative pile-head movement at each load step.
   11. Comments pertaining to interruptions, obstructions or other relevant information.

A. Proof Test Loading Schedule.

Test piles designated for compression or tension proof load testing to a maximum test load of 1.67 times the micropile Design Load or the sum of loads shown on the Plans producing the maximum foundation reaction, or as defined in the approved Working Drawings (whichever is greater). Proof tests shall be made by incrementally loading the micropile in accordance with the following schedule, to be used for both compression and tension loading:

AL = Alignment Load DL = Design Load

	LOAD	HOLD TIME
1	AL	1 minute
2	0.25 DL	1 minute
3	0.50 DL	1 minute
4	0.75 DL	1 minute
5	1.00 DL	1 minute
6	1.33 DL	**10 or 60 minute**
7	**1.67 DL**	1 minute
8	AL	1 minute

Depending on performance, either a 10 minute or 60 minute creep test shall be performed at the 1.33 DL Test Load. Where the pile top movement between 1and 10 minutes exceeds 1 mm, the Maximum Test Load shall be maintained an additional 50 minutes. Movements shall be recorded at 1, 2, 3, 5, 6, 10, 20, 30, 50, and 60 minutes. The alignment load shall not exceed 5 percent of DL. Dial gauges shall be reset to zero after the initial AL is applied.

The acceptance criteria for micropile proof load tests are:

1. The test pile shall support the service design load values with a total pile top displacement of not greater than 0.25-inches. For compression testing, the total displacement shall be measured relative to the pile top position start of initial testing.
2. At the end of the 1.33 DL creep test load increment, test piles shall have a creep rate not exceeding 1 mm/log cycle time (1 to 10 minutes) or 2 mm/log cycle time (6 to 60 minutes). The creep rate shall be linear or decreasing throughout the creep load hold period.
3. Failure does not occur at the 1.67 DL maximum test load. Failure is defined as the load at which attempts to further increase the test load simply result in continued pile movement.

B. Proof Test Pile Rejection.

If a proof-tested micropile fails to meet the acceptance criteria, the Contractor shall immediately proof test another micropile within that footing. For failed piles and further construction of other piles, the Contractor shall modify the design, the construction procedure, or both. These modifications may include installing replacement micropiles, incorporating piles at not more than 50% of the maximum load attained, postgrouting, modifying installation methods, increasing the bond length, or changing the micropile type. Any modification that necessitates changes to the structure design shall require the Engineer's prior review and acceptance. Any modifications of design or construction procedures, or cost of additional proof load testing, or replacement production micropiles, shall be at the Contractor's expense.

Method of Measurement:

A. The drilled micropiles incorporated in the completed work for the structure foundation will not be measured but will be paid for at the Contract lump sum price for Drilled Micropiles. The price shall be full compensation for all design, plan preparation, construction, load testing at the frequency specified herein and materials including micropile to cap connections.

B. Penetrating or removing of obstructions will be incidental to the installation of the micropiles.

C. Drilled micropile load tests will only be measured by the number of tests each completed and approved by the Engineer for the Micropile Proof Load Test items specified when requested by the Department in addition to the total number of tests required at the frequency specified herein.

Basis of Payment:

A. The work of this Section will be paid at the Contract unit prices for the quantities as specified above. All costs in connection therewith, including designing of micropile system, reinforcing steel, permanent casing, grout, micropile construction and load testing, and connection of micropile to cap shall be included in the lump sum price.

B. Micropile Proof Load Test will be only be paid for at the Contract unit price per each as specified above.

11/24/15

619561 - STEEL PIPE PILES, 12 3/4" DIAMETER

Description:

This work shall consist of furnishing and installing 12 3/4" outside diameter steel pipe piles with a 0.5" wall thickness.

Materials:

Steel pipe piles shall conform to ASTM A 252, Grade 3.

Concrete Materials:	Section 602 (Class B)
Reinforcing Steel:	Section 603 (plain)

Construction Methods:

All construction shall be performed in accordance with applicable portions of Section 618 & 619 of the Standard Specifications and as modified herein.

Method of Measurement:

Steel Pipe Piles, 12 3/4" Diameter will be measured per linear foot in accordance with Section 619.19 of the Standard Specifications except as modified herein. Concrete and reinforcing steel bars will not be measured for payment

Basis of Payment:

The quantity of Steel Pipe Piles, 12 3/4" Diameter will be paid in accordance with Section 619.20 of the Standard Specifications and at the Contract unit price bid per linear foot. Price and payment will constitute full compensation for furnishing and installing all piles including concrete and plain reinforcement steel and and for all labor, equipment, tools, and incidentals required to complete the work.

8/11/15

619562 - HELICAL PILES
619563 - HELICAL PILE STATIC PROOF LOAD TEST

Description:

This work pertains to geotechnical and structural design and furnishing all materials for and installation of helical piles to support the Boardwalk Structure and any temporary bridge structure required for site mobility and utility crossing in accordance with the Drawings and these specifications, including the installation of all necessary mechanisms to connect helical piles to the supported structure. Each helical pile shall be installed at the location and to the elevation, minimum length, and installation torque indicative of the design allowable capacities shown on the Plans or as established by the Contractor and approved by the Engineer. In addition, helical piles shall be load tested as specified herein.

The Contractor shall select the helical pile type, size, installation means and methods, and means and methods of connecting the helical pile caps to the supported structure. The Contractor shall perform all geotechnical and structural design. Pile proof load testing shall be performed at a frequency of at least one per every 100' of trail structure alignment where helical piles are proposed by the Contractor. The helical screw piles shall be designed with a minimum Factor of Safety equal to 2.0 for bearing and uplift capacities. Lateral capacities of the helical piles shall be determined based on the tolerable differential movements between adjacent piers producing stresses on the structural timber or selected equivalent structural component below the allowable material structural strength indicated on the Plans.

The Contractor shall determine the number and layout of helical piles necessary to support the proposed Boardwalk Structure at each pier location according to the required design allowable capacities and load test results. Any changes to the pile layout as a result of unexpected outcome from the load tests shall be submitted to the Engineer for review. No additional time or compensation will be allowed.

Additional soil borings, test piles or other in-situ tests may be conducted as part of the construction, if the Contractor deems that more soil information is required. The cost of additional subsurface data collection will be incidental to the cost of this item.

Submittals:

A. At least 7 days prior to the preconstruction meeting, verification of the following requirements and documents shall be submitted by the Contractor to the Engineer for review and approval:

1. Qualifications
   The Contractor shall submit the completed project reference list and personnel. The project reference list shall include a brief project description with the owner's name and current phone number. The personnel list shall identify the helical pile design engineer, supervising geotechnical project engineer, personnel who will install the helical piles and the on-site foremen to be assigned to the project. The personnel list shall contain a summary of each individual's experience and be complete for the Engineer to determine whether each individual satisfies the following required qualifications:
   a. The Contractor shall be experienced in the installation of helical piles and have successfully constructed at least three (3) projects involving the installation of helical piles in the last five (5) years. The projects should involve the installation and load testing of helical piles of similar scope, foundation loads, access and subsurface conditions to this project.
   b. The Contractor shall supply a geotechnical project engineer to supervise the work with experience on at least three (3) projects of similar scope to this project completed over the past five (5) years. The Contractor shall not use a manufacturer's representative to satisfy the supervising engineer requirement of this Section.
   c. A manufacturer's representative is required to be on-site during installation of at least the first helical pile. The on-site foremen, who will be in charge full-time of all operations, shall also have experience on at least three (3) projects over the past five (5) years installing helical pile foundations.
   d. The helical piles shall be designed by a Professional Engineer licensed in the State of Delaware with experience in the design of at least three (3) successfully completed helical

pile foundation projects over the past five (5) years. The helical pile design engineer may be an employee of the Contractor or a separate Consultant designer.

The Engineer may require the Contractor to acquire the services of an Independent Testing Agency (ITA) to manage the load testing of helical piles. When required, the ITA shall provide a full time field engineer to install instrumentation onto the pile foundation, record all load test data, and develop a summary report for each load test of the obtained load test results accompanied with a signed and sealed certification letter. The ITA's field engineer or supervisor shall be a Professional Engineer licensed in the State of Delaware, with demonstrated record of experience in foundation load testing with at least three (3) successfully completed helical pile foundation load tests in the past five (5) years. A copy of the ITA engineers' resumes shall be submitted to the Engineer for review and approval.

The Engineer will determine the Contractor's acceptability within 15 calendar days after receipt of a complete submission. Additional time required due to incomplete or unacceptable submittals shall not be cause for a time extension or impact or delay claims.

B. Prior to the commencement of construction, the Contractor shall submit to the Engineer the following documents for review and acceptance:

1. Design/Working Drawing Submittals
   a. The Contractor shall submit complete design calculations and Working Drawings for review and approval. The drawings and calculations shall be signed and sealed by the Contractor's helical pile designer, who shall be a Professional Engineer licensed in the State of Delaware.

   b. The design calculations shall include, but not be limited to, the following:
      1. Written summary describing the overall helical pile design;
      2. Applicable code requirements and design references;
      3. Helical pile critical design cross section including the provision for corrosion, soil strata and magnitude and direction of design applied loadings;
      4. Design criteria including soil shear strengths, unit weight, and helical pile strength;
      5. Design calculation sheets with the project number, helical pile structural location, designation, date of preparation, initials of designer and checker and page number at the top of each page;
      6. Design notes including an explanation of any symbols and computer programs used in the design. If a computer program is used for design, provide a hand calculation of at least one computer based calculation for verification;
      7. Clear identification of the estimated installation torque and available options to revise pile configuration if this installation torque is not achieved;
      8. All required structural calculations including critical design typical sections, and pile to cap connection. Details currently shown on the Plans shall be evaluated by the Contractor based on their pile system, and modified accordingly. All details shall be submitted for approval. No additional compensation shall be given to modify the current details.

   c. Provide shop drawings indicating product components and accessories and indicating the following:
      1. Helical pile number.
      2. Location and pattern by assigned identification number.
      3. Helical pile design load.
      4. Type and size of central steel shaft.
      5. Helix configuration (number, vertical spacing and diameter of helix plates).
      6. Required minimum effective installation torque.
      7. Displacement plates/centralizers and their location.
      8. Minimum overall length.
      9. Inclination of helical piles.
      10. Grout column length.
      11. Minimum cased length.
      12. Grout column diameter(s).
      13. Cutoff elevation.
      14. Detail showing the helical screw pile attachment.

d. Plan showing pile layout per pier, and identifying the planned pile proof load test sites per specified load testing frequency.
e. General notes for constructing and installing the helical pile foundation including construction sequencing.
f. Contingency plans (or plan of action) should refusal be encountered.

2. Construction Submittal

The Contractor shall prepare and submit for review and approval a detailed step-by-step description of the proposed helical pile installation and load testing procedure, including personnel and equipment to assure quality control. This step-by-step procedure shall be indicated on the working drawings in sufficient detail to allow the Engineer to monitor construction quality. Signed and sealed design calculations for the pile and reaction frame system by a Professional Engineer licensed in the State of Delaware shall also be included.

3. Quality Assurance/Control Submittals

a. Certified test reports shown in compliance with specified characteristics and physical properties.
b. Manufacturer's certificate that products meet or exceed specified requirements.
c. Mill test reports.
d. Accurately record the type, size and actual locations of helical piles, torque installation records on all helical piles and torque monitoring calibration data.
e. Grout mix design and minimum compressive strength.
f. Pile load testing procedures.
g. Calibration reports for load test cell jack.
h. Proposed construction QA/QC methods.
i. Durability data for review.

C. During construction, the Contractor shall provide copies of all inspection logs of each installed helical pile within 24 hrs of completion. Records should include the following as a minimum:
1. Pile designation number and date of installation.
2. Top of pile elevation immediately after installation.
3. Tip elevation as installed.
4. Spacing between helixes.
5. Deviation from specified working drawing location in inches to the nearest ½ inch.
6. Pile length immediately after installation to the nearest 0.1 foot.
7. Bottom elevation of drill casing upon completion of drilling and bottom elevation of steel core reinforcing.
8. Description of any deviations from the design location and batter or from the approved pile design and installation procedures, and description of any unusual occurrences during drilling, installation and grouting after notifying the Engineer
9. Grout volumes.
10. Inclinations of the drilled battered pile installed.

D. Within thirty (30) days after completion of all required work for installing the proposed helical piles, the Contractor shall submit the following documents:
1. Signed and sealed as-built drawings showing the locations and top and bottom elevations of all installed helical piles. Plans shall be signed and sealed by the helical pile design engineer and supervising project engineer, and shall be accompanied with a certification letter, also signed and sealed by the two (2) engineers indicated herein, that all helical piles were installed in accordance the approved working drawing and design calculations. The installation record of each helical pile shall be appended to the certification letter.
2. Signed and sealed load test site reports.
3. Revised design calculations signed by the approved licensed Professional Engineer for all design changes made during the construction, installation and load testing of the helical piles.

Materials:

All materials for this work shall be new and without defect. Defective materials shall be removed from the jobsite at no additional cost. All helical piles shall be hot dipped galvanized for corrosion protection. A 0.125 inch section loss per face shall be considered on all steel sections above the minimum pile tip elevation shown on the plans to account for corrosion.

1. Central Steel Shaft – consists of lead sections, helical extensions and plain extensions. Hot rolled round or round cornered-square pipe meeting dimensional and workmanship requirements of ASTM A29. The bar shall either be modified medium carbon steel grade with torsional strength rating of 5,500 ft-lb and a minimum yield strength of 70 ksi or high-strength low-alloy, low to medium carbon steel grade with a minimum torsional strength rating of 15,000 ft-lb and minimum yield strength of 90 ksi. Minimum diameter of central steel shaft is 5 ¾ inches and a minimum thickness is 0.5 inch or structural equivalent.
2. Helix Bearing Plate – Hot rolled carbon steel sheet, strip or plate formed on matching metal dies to true helical shape and uniform pitch. Bearing plate material shall conform to the following ASTM specifications:
   a. ASTM A572 or ASTM A1018 or ASTM A656 with minimum yield strength of 50 ksi. Plate thickness $^{3}/_{8}$ inch.
   b. ASTM A656 or ASTM A1018 with minimum yield strength of 80 ksi. Plate thickness $^{3}/_{8}$ inch.
   c. ASTM S656 or ASTM A1018 with minimum yield strength of 80 kis. Plate thickness ½ inch.
   d. ASTM A36 or ASTM A572, ASTM A1018, or ASTM A656 depending on helix diameter, per the minimum yield strength requirement cited above. Plate thickness $^{3}/_{8}$ inch.
3. Bolts - The size and shape of bolts used to connect the central steel shaft section together shall conform to the following ASTM specification:
   a. ¾ - inch diameter bolt per ASTM A320, grade L7.
   b. $^{7}/_{8}$ – inch diameter bolt per ASTM A193, Grade B7.
   c. 1 1/8 –inch diameter bolt per ASTM A193, Grade B7.
   d. 1 ¼ - inch diameter bolt per ASTM A 193, Grade B7.
   e. ¾ - inch diameter bolts (3 per coupling) per SAE J429, Grade 5.

4. Couplings shall be formed as integral part of the plain and helical extension material.
5. Fabricate displacement plates from steel or other material that will not affect the structural integrity of the central steel shaft of grout column. Wood shall not be used.
6. For structural steel plates and shaft for helical pile top attachments, conform to ASTM A36 or ASTM A572, Grade 50 (Grade 345).
7. Steel casing shall conform to requirements of ASTM A53 Type E or S Grade B, ASTM A252 Grade 2, ASTM A500 Grade B or ASTM A618.
8. For PVC casing relied upon for grout containment, fissured or void filled solid, or as a bond breaker, the pipe shall conform to ASTM D 1784, ASTM D 1785 and ASTM D3034.
9. Accessories:
   a. Cement for helical pile grout shall be portland cement conforming to ASTM C150 Type I or Type II.
   b. Admixtures and Chemical Admixtures shall conform to the requirements of ASTM C494. Do not use accelerators. Chemical admixtures shall be compatible with the central steel and mixed in accordance with the grout manufacturer's recommendations.
   c. Mineral Admixtures shall conform to the requirements of ASTM C618 (coal fly ash) or C 1240 (silica fume).
   d. Mineral Admixtures shall be compatible with the central steel shaft and mixed in accordance with the grout manufacturer's recommendations.
   e. Mixes – the grout mix shall be designed by the Contractor and submitted for approval. The grout mix shall be proportioned to produce a hardened grout which will achieve the design compressive strength of 4,000 psi within 28 days.

Construction Methods:

The following minimum procedures shall be performed.

Work shall not start, nor materials ordered until the Engineer's approval of the Contractor's experience qualifications is given. The Engineer may suspend work if the Contractor uses non-approved personnel. If work is suspended, the Contractor shall be fully liable for all resulting costs and no adjustment in contract time or cost will result from the suspension.

All helical pile materials shall be handled and transported carefully to prevent any deformation or damage. Care should be taken to prevent the accumulation of dirt, mud or other foreign matter on the steel materials, such accumulation shall be completely removed prior to installation.

1. General
   a. Comply with the instructions and recommendations of the helical pile manufacturer.
   b. Verify that site conditions are acceptable and installation of helical piles are in accordance with all pertinent codes and regulations regarding such items and underground obstructions, right-of-way limitations, utilities, etc.
   c. The helical pile installation techniques shall be consistent with the geotechnical, logistical, environmental and load carrying conditions of the project.
   d. Installation equipment shall be rotary type, hydraulic power driven torque motor with clockwise and counterclockwise rotation capabilities.
   e. Utilize a torque motor capable of continuous adjustment to number of revolutions per minute (RPM) during installation and with a torque capacity 15 percent greater than the torsional strength rating of the central steel shaft to be installed. Do not use percussion drilling equipment.
   f. Utilize equipment capable of applying adequate downward pressure and torque simultaneously to suit project soil conditions and load requirements and capable of continuous position adjustment to maintain proper helical pile adjustment.
   g. A calibrated torque indicator shall be used during helical pile installation. The torque indicator may be an integral part of the installation equipment or mounted in-line with the installation tooling.
2. Installation
   a. Engage and advance helical piles into soil in a smooth, continuous manner at a rate of 5 – 20 RPM. Provide extension sections to obtain the required minimum overall length and installation torque as shown on the shop drawings. Connect sections together using coupling bolt and nut tightened to torque of at least 40 ft-lb or as specified in approved shop drawings.
   b. Apply sufficient down pressure to uniformly advance the helical pile sections approximately 3 inches per revolution. Adjust rate of rotation and magnitude of down pressure for different soil conditions and depths.
   c. Position a lead displacement plate of appropriate diameter on the central steel shaft at the location necessary to install the grout column as shown on the shop drawings. Do not position the lead displacement plate closer than 12 inches above the top helix plate. Position additional lead displacement plates or extension displacement plates no more than 7 feet apart. Displacement plates shall permit the free flow of grout without misalignment of the central steel shaft.
   d. Contractor shall place grout to achieve minimum grout column length as shown on the approved shop drawings. Allow grout to attain the minimum design strength prior to being loaded.
   e. If required, install casing in segments corresponding to the section of the central steel shaft. Advance casing into the soil by direct connection with lead and extension displacement plates. Fill each casing segment with grout immediately after placement.
   f. Satisfy the minimum installation torque and minimum overall length criteria as shown on the shop drawings prior to terminating the helical piles. The torque, as measured during the installation, shall not exceed the torsional strength rating of the central steel shaft.
   g. The uppermost helix shall be installed at least three diameters into competent load bearing soil and below the minimum pile tip elevation shown on the Plans.
   h. Center-to-center spacing of adjacent piles shall be greater than or equal to five diameters of largest helix. When only a shorter spacing can be achieved, the group effects shall be evaluated by the helical pile designer. The calculations shall be submitted to the Engineer for review.
   i. If a helical pile is refused or deflected by a subsurface obstruction, the Contractor shall terminate the installation, and immediately notify the Engineer and indicate the contingency plan that will be implemented, prior to proceeding with construction. A letter or email of concurrence for the implementation of the contingency by both the design engineer and supervising project engineer shall accompany the contingency plan. Install the helical piles to the following allowable tolerances:
      1. Centerline of pile shall not be more than 3 inches from the indicated plan location.
      2. Pile plumbness shall be within 2 degrees of design alignment.
      3. Top elevation of pile shall be within 2 inches of design vertical elevation.

3. Helical Pile Proof Load Testing:

a. Perform a minimum of one proof load test every 100' of trail structure alignment in which helical piles are proposed to support the Boardwalk Structure in either tension or compression loading, with at least one third (1/3) of the total number of tests shall be performed under compression loading.
b. Perform the compression test in accordance with ASTM D-1143 and the tension test per ASTM D3689. Each load tests shall be conducted, the results evaluated, reviewed and accepted by the Engineer prior to installing additional production piles on additional piers.
c. Submit to the Engineer the details of the proposed load test set-up and all equipment and measurement systems to be used for the test, and obtain approval from the Engineer before any load test is made. All load tests shall be observed by the Engineer or authorized representative.
d. Apply the load to the pile core by means of a single hydraulic jack. Construct the apparatus for applying the loads to the test pile so that the loads are applied axially to the pile. Calibrate the test load jacking system including the hydraulic jack, and pressure gauge prior to the test so that the load applied is controlled to within 5 percent of the total applied load. Submit calibration reports to the Engineer prior to the start of the pile load test. Calibration tests shall be performed within 90 days of the date of the load test.
e. Provide all necessary materials and labor for construction of a settlement measuring system for each test, as follows:

    1. Provide an independent reference beam for load test measurement apparatus support. The reference beam must be independently supported with supports firmly embedded in the ground at a distance at least 8 feet from the test pile and reaction piles. One end of the reference beam must be free to move as the length of the beam changes with temperature variations.
    2. Mount a minimum of three dial gauges equidistant from the center of the test pile and at 120-degree intervals around the pile. Attach the dial gauges rigidly to the reference beam. Align gauge stems vertically and provide smooth horizontal bearing surfaces for the gauge stems. Dial gauges shall have at least 2-inch travel and shall read to 0.001 inch.
    3. Establish a reference point on the test pile and at each end or the center of the reference beam. The reference points shall consist of graduated scales machine-divided into 0.02-inch and attached securely to the pile and reference beam. The reference points shall be monitored using survey equipment during the pile load test.
    4. Protect the settlement measuring system against rain, wind, frost, and any other disturbances that could affect the reliability of the settlement observations. Provide sunshading for the measuring system for the duration of the test and for a minimum of 1-hour prior to the start of the test.

f. Submit a detailed load test site report including such information as pile location, type, diameter, length, settlement readings, and all other pertinent data as indicated in ASTM D-1143 for compression load tests or ASTM D3689 for tensile load tests. Each load test report shall be accompanied by a signed and sealed certification letter by the supervising geotechnical project engineer or ITA's engineer responsible for the load tests (when requested by the Department). The following information shall be included as a minimum:
    1. Name of project and Contractor.
    2. Name of Contractor's supervisor during installation.
    3. Name of third party test agency, if applicable.
    4. Date, time and duration of test.
    5. Location of helical piles assigned identification number.
    6. Type of test (tension or compression).
    7. Description of calibrated testing equipment and test setup.
    8. Actual helical pile type and configuration, including lead section, number and type of extension sections.
    9. Steps and duration of each load increment.
    10. Cumulative pile-head movement at each load step.
    11. Comments pertaining to interruptions, obstructions or other relevant information.

Proof Test Loading Schedule.

Test piles designated for compression or tension proof load testing to a maximum test load of 1.67 times the helical pile Design Load or the sum of loads shown on the Plans producing the maximum foundation reaction, or as defined in the approved Working Drawings (whichever is greater). Proof tests shall be made by incrementally loading the micropile in accordance with the following schedule, to be used for both compression and tension loading:

AL = Alignment Load DL = Design Load		
	LOAD	HOLD TIME
1	AL	1 minute
2	0.25 DL	1 minute
3	0.50 DL	1 minute
4	0.75 DL	1 minute
5	1.00 DL	1 minute
6	1.33 DL	**10 or 60 minute**
7	**1.67 DL**	1 minute
8	AL	1 minute

Depending on performance, either a 10 minute or 60 minute creep test shall be performed at the 1.33 DL Test Load. Where the pile top movement between 1and 10 minutes exceeds 1 mm, the Maximum Test Load shall be maintained an additional 50 minutes. Movements shall be recorded at 1, 2, 3, 5, 6, 10, 20, 30, 50, and 60 minutes. The alignment load shall not exceed 5 percent of DL. Dial gauges shall be reset to zero after the initial AL is applied.

The acceptance criteria for helical pile proof load tests are:

1. The test pile shall support the service design load values with a total pile top displacement of not greater than 0.25-inches. For compression testing, the total displacement shall be measured relative to the pile top position start of initial testing.
2. At the end of the 1.33 DL creep test load increment, test piles shall have a creep rate not exceeding 1 mm/log cycle time (1 to 10 minutes) or 2 mm/log cycle time (6 to 60 minutes). The creep rate shall be linear or decreasing throughout the creep load hold period.
3. Failure does not occur at the 1.67 DL maximum test load. Failure is defined as the load at which attempts to further increase the test load simply result in continued pile movement.

Proof Test Pile Rejection.

If a proof-tested helical pile fails to meet the acceptance criteria, the Contractor shall immediately proof test another pile within that footing. For failed piles and further construction of other piles, the Contractor shall modify the design, the construction procedure, or both. These modifications may include installing replacement helical piles, incorporating helical piles at not more than 50% of the maximum load attained, modifying installation methods, increasing the bond length, or changing the helix sizes and configuration. Any modification that necessitates changes to the structure design shall require the Engineer's prior review and acceptance. Any modifications of design or construction procedures, or cost of additional proof load testing, or replacement production piles, shall be at the Contractor's expense.

Method of Measurement:

Helical piles and Helical Pile Static Proof Load Tests will not be measured for payment.

Helical pile load tests will only be measured by each test completed and approved by the Engineer for Helical Pile Proof Load Test items when requested by the Department in addition to the total number of tests required and at the frequency specified herein.

Basis of Payment:

Helical piles will be paid for at the Contract lump sum price for Helical Piles. The price shall include all design, submittals, drawings, materials, and labor required for proper installation and static proof load testing, at the frequency specified herein, of helical piles.

Helical Pile Static Load Test will be paid per the Contract unit price per each only when requested by the Department in addition to the number of successful load tests resulting from the specified frequency Payment shall be full compensation for all costs related to the mobilization, installation, instrumentation, performance and documentation of the static load tests.

No separate payment shall be made for salvaging, abandoning or removing and disposing of obstructions and cost for required work shall be incidental to the installation of the item.

11/24/15

619564 - INSTALL STEEL H PILES, HP 14 X 89
619565 - INSTALL STEEL H TEST PILES, HP 14 X 89

Description:

This work consists of installing steel H piles. This work also consists of extracting, removing, and disposing of any test pile where required.

Materials:

Not applicable.

Construction Methods:

Reference applicable portions of Section 619.

Method of Measurement:

The installed quantity of test piles and production piles will be field measured as the total number of linear feet (linear meters) from final tip elevation to final cut-off elevation for each type of pile acceptably driven. The quantity of material used for driving splices on test piles and production piles will not be measured and paid under this Section but will be measured and paid under 618535 and 618536. The cost of constructing driving splices will not be measured and paid. The quantity of pile cut-offs for all pile types will not be measured for payment.

Basis of Payment:

The installed quantity of steel H test piles and production piles will be paid for at the Contract unit price per linear foot. Price and payment will constitute full compensation for driving and all work associated with the installation of piles, including augering and jetting, unless noted otherwise, and restriking piles and test piles per Subsection 619.14; for conducting and submitting the wave equation analysis; for driving additional test piles; for performing dynamic pile testing if the Contractor elects to change hammers; for driving additional piles adjacent to rejected piles; for revising footings or abutments due to additional piles; and for all equipment, labor, tools, and incidentals required to complete the work.

The labor required to cut-off piles will be considered incidental to the cost installation. Price and payment will constitute full compensation for acceptably performing a pile cut-off to the details and elevation shown on the Plans; for the disposal of cut-off piles; and for all equipment, labor, tools, and incidentals required to complete the work.

The cost of constructing splices will be considered incidental to the unit price bid.

No payment will be made for production piles and test piles not accepted, production piles and test piles improperly driven, or production piles and test piles damaged during driving.

It is understood that driving additional test piles as required by the Engineer, due to conflicting, inconclusive, or unsatisfactory original test pile data and information, shall not serve as the basis for an increase in the original Contract unit price per linear foot for the type of pile, nor any other extra or increased compensation other than normal increase in payment due to the extra quantity of test piles to be paid for under this Section.

12/7/15

713500 - GEOTEXTILES, STABILIZATION, SPECIAL

Description:

The Item shall consist of furnishing and installing geotextile fabric in accordance with these Specifications, and within reasonably close conformity to the dimensions, details, and locations shown on the Plans and as directed by the Engineer.

Materials:

The Geotextile fabric shall be brightly colored (orange is preferred), 6 oz/sy, needle punched, nonwoven US 160NW-OR as manufactured by US Fabrics; or an approved equal meeting the following physical properties:

TEST	SPECS	UNIT	VALUE
Tensile Strength	ASTM D-4632	lbs.	160
Elongation @ Break	ASTM D-4632	%	50
Mullen Burst	ASTM D-3786	PSI	315
Puncture Strength	ASTM D-4833	lbs.	90
Trapezoidal Tear	ASTM D-4533	lbs.	65
Apparent Opening Size	ASTM D-4751	US Sieve	70
Permittivity	ASTM D-4491	Sec $^{-1}$	1.60
UV Resistance, % Retained	ASTM D-4355	%	70
Flow Rate	ASTM D-4491	gal/min/sf	110

Construction Methods:

Geotextile fabrics with manufacturing defects, or damage incurred during transportation or storage shall be rejected. Any area of fabric damaged during the installation shall be removed and replaced at the Contractor's expense. No construction equipment shall be permitted to operate directly on the fabric.

The installation of geotextile fabric shall be done in accordance with the details shown on the Plans, and/or the manufacturer's installation procedures for the specific purpose. The Manufacturer's installation guidelines shall be approved by the Engineer prior to its implementation.

Method of Measurement:

The quantity of special geotextile, stabilization, shall be measured by the square yard of top surface area as installed and accepted, including the overlapped portion of the fabric. The overlapped area of the geotextile shall not be measured twice.

Basis of Payment:

The quantity of special geotextile, stabilization will be paid for at the Contract unit price per square yard. Price and payment will constitute full compensation for furnishing all materials including geotextiles, preparation of the ground if required, installing the geotextile in accordance with the Plans and as directed, for all labor, equipment, tools and incidentals necessary to complete the work.

7/29/15

720611 - FLEXIBLE DELINEATOR, PERMANENT

Description:

This work consists of supplying and placing flexible delineator markers adjacent to the asphalt trail. Installation location shall be as described in the Plans and as directed by the Engineer.

Materials:

Flexible delineators shall be made of a material that can be struck without causing damage to the impacting vehicle. They shall be not be less than 36" high.

Construction Methods:

The flexible delineator must be embedded into the ground using a method that is approved by the product manufacturer.

Method of Measurement:

The quantity will be measured as the actual number of flexible delineators installed.

Basis of Payment:

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

12/7/15

737523 - PLANTINGS

737.01 Description.

This work consists of furnishing and planting specified plants, shrubs, and trees and the replacement and cultural care of the material.

MATERIALS.

737.02 Plant Material.

a. *Quality.* All plants shall be true to type and nomenclature and typical of their species or variety. They shall have a normal habit of growth with well-developed branch systems and vigorous root systems. They shall be sound, healthy, and vigorous plants, free from defects, disfiguration, injury, disease of any kind, insect eggs, borers, and any infestation. All plants shall be nursery grown. They shall have been growing under similar climatic conditions to those of the locality of the Project for at least two years prior to planting. All plant material shall have been grown in a soil that is similar to this area and shall not have been grown in a muck type soil or other foreign type. It shall be the responsibility of the Contractor to inspect the plants before removal from the nursery where they have been grown to make sure that the plants meet these requirements. All plants shall be freshly dug, and no heeled-in or cold storage plants will be accepted, with the exception of plant material delivered prior to planting as outlined in Subsection 737.14.

b. *Measurements.* All plants shall conform to all sizes and measurements specified in the Plant List. Plants that conform to the requirements specified in the Plant List but do not have a normal balance between height and spread will not be accepted. Where any requirement or exact measurement is omitted, the plants furnished shall be normal for the species and variety as listed in AAN's "USA Standards for Nursery Stock". Plants for use where symmetry is required shall be matched as close as possible. All plants shall be measured for height and spread with the branches in their normal position. The trunk diameter of all trees shall be taken 6" (150 mm) above the ground level for up to and including 4" (100 mm) diameter sizes, and 12" (300 mm) above the ground level for larger sizes. The height of the branches on the tree trunks need not be as specified if the required height can be obtained by pruning the lower branches without leaving unsightly scars and damaging the trunk. No pruning of branches for this effect shall be done before delivery to the site unless approved. Plants larger in size than specified may be used. Larger plants, when selected for use over that which is specified, shall be dug with an earth ball or root spread proportionate to the increased size. With plants smaller than specified, credit shall be offered to the Department for approval. The basis of a credit shall be the average wholesale value based on the difference between the specified size and the next smaller size. The average wholesale value shall be substantiated with written submissions in accordance with Subsection 737.02 (e).

c. *Inspection.* The Contractor shall be responsible for all certificates of inspection of plant materials that may be required by Federal, State, or other authorities to accompany shipment of plants. The Contractor shall furnish complete information as to the location of all plants which it intends to supply and use. The right is reserved to inspect, tag, and approve all plants at the source of supply. This inspection and tagging shall not in any way eliminate the right of rejection at the site. All plants must be inspected and approved before they are planted. Any plants placed without prior inspection at the site will be rejected at the discretion of the Engineer. The Plant materials shall be protected according to best horticultural practice while in transit in such a way as to prevent the drying or possible desiccation of plant tissue. All plant material arriving at the site with broken or loose balls, or dry or insufficiently developed roots, and plants which are weak or thin, damaged or defective, or which do not comply with the specifications, will not be accepted. The Engineer reserves the right to reject all stock that is found to be unsatisfactory. All plant material determined as unsatisfactory by the Engineer shall not be planted under any circumstances and shall be removed from the Project site by the close of the working day. Failure on the part of the Contractor to comply with any of the above procedures will require an immediate suspension of all work.

d. *Nomenclature.* Plants shall conform to the nomenclature of "Standard Plant Names" as accepted by the American Joint Commission of Horticulture Nomenclature, 1942 Edition. Names of varieties not included shall conform to names accepted in nursery trade. Size and grading shall conform to those listed in AAN's "USA Standards for Nursery Stock". No substitution will be permitted except by written permission of the Engineer.

e. *Availability.* The Engineer, after receiving written request from the Contractor for substitution, will verify and establish the non-availability of the specified plant and size to this satisfaction. Upon determining that a substitution is justified, the Contractor will be directed to provide certification in the form of five letters from five independent growers who list the specified plant form in their most current catalog, stating that the item in question is not available as specified.

f. *Experience.* Under Special Condition No. 22 of the U.S. Army Corps of Engineers 404 Permit, it is stipulated that: *The mitigation and post-planting monitoring plans shall be developed and implemented by a firm with demonstrated expertise in wetland creation activities.*

Therefore, the firm that does the actual planting and seeding of the mitigation site shall possess a record of successful wetland woody and wetland herbaceous and seeding programs that have received final approval by the U.S. Army Corps of Engineers, or have on-site staff personnel who have managed successful wetland woody and herbaceous planting and seeding programs that have received final approval by the U.S. Army Corps of Engineers. At the request of the Department, information indicating compliance with this "Special Condition" shall be forwarded within 14 days.

737.03 Trees. Trees shall have straight trunks according to their habit of growth and shall be well branched and rooted. Shade trees of standard variety shall have a single leader and shall be branched at 6 to 8' (1.8 to 2.4 m) height unless otherwise directed.

737.04 Shrubs. Shrubs shall be well branched, with full and compact growth and have ample well branched root systems capable of sustaining vigorous plant growth.

a. *Woody Shrub Cuttings* Cuttings shall be fresh 24" (600 mm) long stems of woody plants. Each cutting shall have a living terminal bud (end bud). Prior to installation, the cutting shall be kept cool and moist to prevent desiccation of the material. Degraded, rotting, or dried out material will not be accepted.

737.05 Ground Cover and Herbaceous Perennials.

Ground cover shall be one year old, container grown plants, unless otherwise approved or specified in the Contract documents and shall have been growing for at least six months in the size specified as verified by the Department's inspection representative. Herbaceous plant material shall be at least six months old and shall have been growing for at least three months in the size specified unless otherwise detailed in the plans, and as verified by the Department's inspection representative.

737.06 Soil Mix.

a. *Topsoil.* Planting topsoil shall consist of natural surface soil from well drained areas from which no topsoil has previously been stripped. The topsoil shall be free of subsoil, heavy clay, hard clods, weeds, roots, sticks, toxic substances, or any other extraneous material. The topsoil shall have a pH range of from 5.5 to 6.8 and contain not less than 2% nor more than 10% organic matter. The topsoil shall exhibit the following grading analysis:

Sieve Size Minimum Percent Passing
2" (50 mm) 100
No. 4 (4.75 mm) 90
No. 10 (2.00 mm) 80

The Contractor shall take the necessary action to ensure that the topsoil meets the sieve analysis, acidity, and organic matter requirements. A certificate of analysis of soil samples shall be provided to the Engineer and approved prior to delivery of topsoil to the Project site.

b. *Peat Moss and Peat Humus.*

i. *Peat Moss. Peat moss shall be from sphagnum peat bogs. All peat moss shall be shredded, not dusty, and free of twigs, stones, hard lumps, roots, or any other undesirable materials. All peat moss must be moistened before using, but not watered to a saturated or puddled, unworkable condition. Peat moss shall show an acid reaction of 3.5 to 5.5 pH. The Contractor shall provide written certification from the manufacturer that the peat moss was obtained from sphagnum peat bogs.*

ii. Peat Humus. Peat humus shall be a natural peat or peat humus from fresh water saturated areas, consisting of sedge, sphagnum, or reed peat and be of such physical condition that it passes through a 2" (12.5 mm) sieve. The humus shall be free from sticks, stones, roots, and other objectionable materials. Samples taken at the source of supply shall have the following analysis:

Acidity Range	*4.0 to 7.5 pH*
Minimum Water Absorbing Ability	*200% by weight on oven-dry basis*
Minimum Organic Content	*60% when dried at 221 EF (105 EC)*

c. Composted leaf mulch free of wood, metallic substances, glass or other contaminates may be used in lieu of peat moss or peat humus.

737.07 Fertilizer. Fertilizer shall be a 20-10-5 analysis or approved equal in accordance with the following minimum guaranteed analysis:

Total Nitrogen (N)	20.00%
Derived from urea-formaldehyde	
7.0% water soluble nitrogen	
13.0% water insoluble nitrogen	
Available Phosphoric Acid (P2O5)	10.00%
Derived from calcium phosphate	
Soluble Potash (K2O)	5.00%
Derived from potassium sulfate	
Combined Calcium (Ca)	2.60%
Derived from calcium phosphate	
Combined Sulfur (S)	1.60%
Derived from ferrous and potassium sulfates	
Iron (expressed as elemental Fe)	0.35%
Derived from ferrous sulfate	

The fertilizer shall be formulated in tablet form weighing a minimum of 20g per tablet.

The fertilizer shall conform to all State and Federal regulations. The Engineer will require the Contractor to furnish an affidavit from the vendor or a testing laboratory as to the available nutrients contained therein.

Fertilizer shall be furnished in new, clean, sealed, and properly labeled packages or containers. Fertilizer failing to meet the specified analysis may be used as determined by the Engineer, providing sufficient materials are applied to comply with the specified nutrients per unit of measure.

737.09 Mulch. Mulch shall be shredded hardwood bark or wood chips, or an approved equal as accepted by the Engineer. All mulching materials will be visually inspected by the Engineer prior to delivery at the planting site and shall conform to the following requirements:

a. Shredded hardwood bark shall be from a deciduous hardwood source and be mechanically ground to a maximum size of 6" (150 mm). In addition, the bark shall be relatively free of bark fines dust and shall exclude all foreign and toxic substances.

b. Wood chips must be stockpiled for at least one year prior to placement as verified by the Department's inspection representative and shall not contain leaves, twigs, wood shavings and sawdust, or any foreign or toxic substances. In addition, loose, non-pelletized fertilizer with analysis in accordance with Subsection 737.07 shall be applied at the rate of 0.5 lb/yd^2 (0.25 kg/ m^2) prior to wood chip placement.

Only one of the above mulches will be selected and approved for use throughout the entire Project, and written certification for the above listed requirements of the mulch shall be submitted by the Contractor.

737.10 Stakes, Guys, and Related Materials. Staking and guying shall be as per the Standard Construction Details or alternate method approved by the Engineer.

a. *Tree Stakes.* Hardwood stakes shall be at least 2" by 2" (50 by 50 mm) rough sawed to the length required. Stakes shall be free from knots, rot or other defects that impair strength.
b. *Guying straps.* Guying straps shall be one and one-half to two inches (1.5-2.0") wide, of polymer or nylon construction, with grommets at both ends to accept wire or heavy twine.
c. *Anchoring systems.* Anchors for guy wire shall be malleable iron or aluminum alloy with 3000 lb (13 kN) holding capacity designed to be inserted with a driving rod to a depth specified by the manufacturer. The anchor assembly shall be designed to turn, once located at the proper depth, at a right angle to the line of force applied. All manufacturers' recommendations shall be followed for installing ground anchoring systems.

737.11 Water. Conform to the requirements of Section 803.

CONSTRUCTION METHODS.

737.12 Planting Periods. Plant during the following planting period with the exceptions as noted:

Balled or Burlapped and Potted or Container Grown Plant Material:
March 1 to May 15; September 1 to November 30:
(1) All planting of broadleaf evergreens during the fall season shall be completed by November 1.
(2) All material planted from May 16 to August 31 must be treated with an approved antitranspirant in a manner recommended by the manufacturer, and written approval for moving plants within this period must first be obtained from the Engineer.
(3) Woody Shrub Cuttings Install as dormant materials between October 30 and December 1 or between March 1 and April 1.

The above mentioned periods may be extended or reduced according to weather and soil conditions at the time and upon written request from the Contractor to the Engineer for approval. Planting outside the planting window does not relieve the contractor of his guarantee. The Engineer reserves the right to stop planting operations at any time.

The Contractor shall not plant when weather conditions are unfavorable for proper work or when the soil is in a frozen condition.

737.13 Soil Mixture. Soil mixtures for the various plantings shall consist of the following:

a. *All Plants Except Ericaceous Material.* For each cubic yard (cubic meter) of baled peat moss, or approved equal, add from 43 to 54 yd3; (43 to 54 m3) of planting topsoil.
b. *Ericaceous Plants.* For each cubic yard (cubic meter) of baled peat moss, or approved equal, add from 36 to 45 yd3; (36 to 45 m3) of planting topsoil. If peat humus is furnished in lieu of peat moss in the above mix, the mixture shall be based in the proportion of 1.8 yd3; (1.8 m3) of peat humus for each cubic yard (cubic meter) bale of peat moss specified for the above soil mix. Other approved equal materials shall be mixed according to manufacturer's printed recommendations which shall be submitted to the Engineer for written approval.

The above soil mixtures shall be mixed as specified in an area approved by the Engineer. No mix shall be prepared prior to notification of the Engineer at least 48 hours in advance of the mixing operation. Where ground covers or herbaceous perennials are specified, the soil mix may be mixed in place providing the existing topsoil conforms to the requirements of subsection 737.06.

The fertilizer as specified in accordance with Subsection 737.07 shall be placed according to the following requirements:

a. *Balled and Burlapped, or Container Stock.* Position the plant in the hole, and backfill no higher than halfway up the root ball. Place the recommended number of tablets evenly around the perimeter of and immediately adjacent to the root ball. Complete the backfilling, tamping, and watering.
b. *Small Ground Cover Plants and Herbaceous Perennials.* Position the plant in the hole, and backfill no higher than halfway up the root ball. Place the recommended number of tablets evenly around the perimeter of and immediately adjacent to the root ball. Complete the backfilling, tamping, and watering.

c. *Trees.* Use one 20 g tablet for each 1/2" (13 mm) of tree trunk diameter based on size specified for planting.
d. *Shrubs.* Use one 20 g tablet for each 12" (300 mm) of height or spread based on size specified for planting.
e. *Ground Cover and Herbaceous Perennials.* Use one 20 g tablet for each plant.

No backfill shall be placed in any pit until the excavation has been inspected. Excess excavated material shall be removed from the Project site.

737.14 Digging and Handling. All precautions customary in good trade practice shall be taken in preparing plants for transplanting. Plants transplanted with workmanship that fails to meet the highest standards will be rejected. All balled and burlapped plants shall have firm, natural balls of earth of ample proportions and diameter not less than as specified in AAN's "USA Standards for Nursery Stock". Plants with cracked, broken, or crushed balls, which occur either before or during planting operations, will be rejected or shall be removed from the site immediately. All plants shall be handled so that roots are adequately protected and moist at all times. Material that cannot be planted immediately after delivery shall be adequately protected by covering with canvas, wet straw, burlap, moss, or other suitable material and kept covered until ready to be planted. Trees should not be planted with frozen earth balls. Containerized plant material shall be growing in the specified size container for at least six months and shall not display signs of being root bound or unnatural ratio of planting medium vs. root mass.

737.15 Location of Plants. Plants shall be located as indicated on the Plans, but may be shifted to avoid utilities subject to the approval of the Engineer. No excavation shall commence until locations are approved.

737.16 Planting. All trees and shrubs shall be planted in pits as detailed on the Standard Construction Details. Pits shall not be excavated with vertical sides. Pits shall be of such a depth that, when planted and settled, the crown of the plant shall bear the same relation to finished grade as it did to soil surface in its place of growth. With the approval of the Engineer, the Contractor may elect to plant wetland grown containerized shrubs on small mounds raised no more than 2" (50 mm) above the final grading elevation shown on the Plans. Open plant pits shall not be allowed overnight in residential areas or in any location where it is determined by the Engineer to pose a potential hazard to pedestrians or traffic.

All backfill topsoil shall be covered with a waterproof material after mixing. Pits shall be backfilled with specified soil mix and compacted firmly under ball of roots to establish a firm foundation. Plants shall be set in the center of pits in a vertical position so that the crown of the plant is level with the finished grade after allowing for watering and settling of soil. The "Soil Mixture" shall be carefully and firmly worked and tamped under and around the base of the ball to fill all voids. When partially backfilled and compacted, the burlap and any wire baskets shall be removed from the sides and tops of the balls and cut away to prevent air pockets, but no burlap shall be pulled from under the balls. All burlap, wire baskets and other containers shall be removed from the jobsite at the end of the workday. The balance of the planting hole shall be filled with the planting mixture and a ring of earth shall be formed around the plant to produce a dish for watering. All plants shall be thoroughly watered immediately after planting as directed by the Engineer. This initial watering shall mean complete saturation of all backfill in the pits and beds during the same day of planting. Care shall be taken during all planting operations to ensure that no excavated material is dumped on any grassed area unless a suitable type of matting or protective underlay is used. The Contractor shall be responsible for all damage to any grassed, planted, or other landscaped area caused by its operations and shall repair any damage so caused in a manner satisfactory to the Engineer.

Ground cover and herbaceous perennial areas shall be prepared by rototilling to a minimum depth of 10" (250 mm). The mixing of peat moss, peat humus, or approved equal may be performed separately in order to obtain the proportion of ground cover or herbaceous perennial soil mixture as specified. Beyond the minimum excavation as stated above for soil mixing, the root system of the plant shall determine the actual depth for individual plant excavation. Plants shall be backfilled with the soil mixture and compact firmly around roots. All areas shall have a smooth and uniform grade and a minimum of 2" (50 mm) of approved mulch.

a. *Pruning.* All plants shall be pruned immediately after planting or transplanting to remove all injured or dead wood. All trees inspected and tagged at the nursery shall conform to AAN Standards, and any subsequent pruning by the Contractor shall in no way alter the natural habit or shape of the plant. All pruning shall be done with sharp tools by workers skilled in this operation. All cuts shall be made flush, leaving no stubs. On all cuts over 3/4" (19 mm) in diameter and bruises or scars on the bark,

the injured cambium shall be traced back to living tissue and removed; wounds shall be smoothed and shaped so as to preserve the branch bark ridge.

b. *Watering.* Plants shall be watered on the same day as planting unless otherwise approved by the Engineer. Quantity of water per plant shall be as detailed in Section 737.17.

c. *Mulching.* Trees and shrubs shall be mulched with at least a 4" (100 mm) cover of mulch. Mulch shall be placed the same day of planting, unless otherwise approved by the Engineer.

d. *Wire baskets, nylon binding and treated burlap* shall be cut away and removed from the top half of the root ball.

e. *Staking and Guying.* Unless approved by the Engineer, all staking and guying specified shall be completed the same day as planting and mulching.

f. *Cleaning Up.* Throughout the course of planting, excess and waste materials shall be immediately removed from the site, seeded areas kept clean, and all precautions taken to avoid damage to existing structures, trees, shrubs, plants, and grass. When planting in an area that has been otherwise completed, the area shall, upon completion of the planting, be immediately and thoroughly cleared of all debris, rubbish, subsoil, and all waste materials removed from the site. All ground surfaces shall be raked smooth. All sodded areas disturbed as a result of construction shall be repaired by the Contractor.

737.17 Plant Establishment. The plant establishment period for all planting shall begin immediately after all planting and replacements (as specified under Section 737.16, Planting) are complete and acceptable to the Engineer. The plant establishment period will consist of one full growing season during which time the Contractor shall be responsible for all work necessary to keep the plants in a live and healthy condition. A growing season is defined as the period from May 1 through September 30. If the Contractor completes all planting (as specified under Planting) by May 1, the inspection will be held on or about October 1 of that year. In the event the Contractor does not complete all planting by May 1, the inspection will be held on or about October 1 of the following year. All replacement plant material determined to be necessary at the inspection must then be approved at the replacement plant source by October 15. At this time, the Engineer will direct the Contractor to replace those plants determined to be dead or unhealthy by December 1. The Contractor will notify the Engineer in writing that all replacement planting has been accomplished. The Engineer will conduct an inspection within 15 days after such notification to determine the acceptability of the replacements. If all replacements are determined satisfactory by the Engineer, the Contractor will be relieved of all further responsibility for care and replacement.

All planting areas shall be kept free of weeds and grass during the life of the Contract. The Contractor may utilize a pre- or post-emergent herbicide to control such grass and broadleaf weeds incidental to the cost of planting and be totally responsible for the proper use and placement of any such herbicide. As requested in writing by the Engineer, the Contractor shall be responsible to weed within all plant beds and within the saucer limits of individual plants, beginning 10 calendar days after the date of notification. The Contractor shall prune and apply insecticides or fungicides as required, repair or replace stakes and guy wires, tighten guy cable or wire and repair plant saucer washouts when and as specified by the Engineer.

Any plants that settle below or rise above the desired finished grades shall be reset at the proper grades. If dead or unhealthy plants are discovered, they shall be removed within 10 calendar days and replaced with the next appropriate planting season. All replacements shall be plants of the same kind, size and quality as originally specified in the Contract and they shall be furnished, planted, mulched, guyed, watered, etc. as specified herein for new plant material. The Contractor shall warrant all plant material against defects including death and unsatisfactory growth, except for defects resulting from incidents beyond the Contractor's control, such as vehicular impacts or vandalism. Submission of appropriate police reports or other approved evidence verifying the cause of the damage shall be required to relieve the Contractor of responsibility for replacement.

The cost of the above described work shall be incidental to Section **737**, Planting. Contractor shall be required to water all major and minor trees, shrubs and all herbaceous beds bi-weekly during the period from June 15 through October 1. Watering, once initiated, shall continue without interruption until all plants on the project have been watered. Payment shall be per 1,000 gals of water applied and shall be based on the following schedule: Major trees-15 gals per tree, minor trees-10 gals per tree, shrubs-5 gals per shrub, perennials-10 gals per 100 square feet of planting bed. Water used for this item shall meet the requirements of Section 803 of the Standard Specifications. Tree watering bags, if utilized, shall be filled as a part of the watering operation; payment shall be as detailed herein. Tree watering bags shall remain the property of the contractor and shall be removed prior to final inspection.

737.18 Method of Measurement. The quantity of planting will not be measured.

737.19 Maintenance Bond. Upon Substantial Completion of the Work, the Contractor shall furnish to the Department a Maintenance Bond on the form provided by the Department for item 737523 - Planting. The Maintenance Bond shall meet the following requirements:

A sum equal to 100% of the value of all Planting Items paid to the Contractor, as detailed in the Breakout Sheet; All signatures are original signatures, in ink, and not mechanical reproductions or facsimiles of any kind; The Contractor is the named principle; Section 737.17 – Plant Establishment Work items associated with this section requires completion after substantial completion of the Project. The term of the Maintenance Bond will be for a period of one full growing season, as defined in the section, beyond the completion of permanent planting Work; and, Written by a Surety or insurance company that is in good standing and currently licensed to write surety bonds in the State of Delaware by the Delaware Department of Insurance.

737.20 Basis of Payment.

The quantity of planting will be paid for at the Contract lump sum. Price and payment will constitute full compensation for furnishing and placing all materials, including plants, soil mixes, and mulch; for protecting plants after digging and prior to planting; for staking, excavating plant pits, pruning, and guying; for the cultural care of the plants until the completion and acceptance of all landscape work; for disposing of excess and waste materials; for replacement planting; for cleanup; for repairs to plant material, tree protection, wire, or staking; for repairs to damaged grassed, planted, or other landscaped area due to the Contractor's operations; for ensuring that topsoil meets the sieve analysis, acidity, and organic matter requirements; for applying sufficient materials to fertilizer that originally failed to meet the specified analysis; for using pre- or post-emergent herbicide to control grass and weeds; for the work outlined under Subsection 737.17; and for all labor, equipment, tools and incidentals required to complete the work. The quantity of watering will be paid for in accordance with the price bid for, "Watering," as detailed on the breakout sheet. Payment shall be by the M/Gal (1,000 gallons) of water applied at each watering operation.

The breakout sheet attached to the proposal shows all plant material and the anticipated amount of water proposed for this Contract. The Contractor shall fill in the per each unit price and the cost (unit price times the proposed quantity) for each item listed. The lump sum price bid for 737523 - Planting shall be the sum of the total cost for all species and sizes listed.

The Department reserves the right to delete from the Contract the furnishing and installing of one or more of the species and/or sizes listed and the right to add or subtract from the quantity of each species and size listed. 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 to the Contractor if such additions and/or deletion are made. Watering item shall be paid separately for watering completed at the bid price indicated on the Breakout Sheet.

Payment for the planting as described above may be processed if, in the opinion of the Engineer all work required, except that specified under Subsection 737.17 is satisfactorily completed. No partial payment will be made for any living plant until and unless planted in accordance with these specifications. No additional payment will be made for using plants larger than specified.

On contracts where assessment of time is in working days, the Contractor will be charged working days while engaged in actual planting and directly related work such as plant pit excavation, staking, wrapping, and mulching. The Contractor will not be charged time for indirectly related work such as watering, weed control, pruning, and other responsibilities as described under Subsection 737.17

The cost to remove and replace plants that settle below or rise above the desired finished grades, or that die or are unhealthy as described in Subsection 737.17 shall be the responsibility of the Contractor.

4/30/2015

744500 - CONDUIT JUNCTION WELL, TYPE 6, PRECAST POLYMER CONCRETE
744506 - CONDUIT JUNCTION WELL, TYPE 7, PRECAST POLYMER CONCRETE
744507 - CONDUIT JUNCTION WELL, TYPE 8, PRECAST POLYMER CONCRETE
744508 - CONDUIT JUNCTION WELL, TYPE 9, PRECAST POLYMER CONCRETE
744509 - CONDUIT JUNCTION WELL, TYPE 10, PRECAST POLYMER CONCRETE
744520 - CONDUIT JUNCTION WELL, TYPE 1, PRECAST CONCRETE
744523 - CONDUIT JUNCTION WELL, TYPE 4, PRECAST CONCRETE
744524 - CONDUIT JUNCTION WELL, TYPE 5, PRECAST CONCRETE
744530 - CONDUIT JUNCTION WELL, TYPE 11, PRECAST CONCRETE/POLYMER LID-FRAME
744531 - CONDUIT JUNCTION WELL, TYPE 14, PRECAST CONCRETE/POLYMER LID-FRAME
744532 - CONDUIT JUNCTION WELL, TYPE 15, PRECAST CONCRETE/POLYMER LID-FRAME

Description:

This work consists of supplying, constructing and installing conduit junction wells as shown on the applicable Plan Sheets or Standard Construction details

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.

All required hardware and wire for Bonding and Grounding as shown on the Standard Construction or applicable Plan details.

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

Precast polymer concrete is reinforced by heavy-weave fiberglass with a compressive strength of 9,000-15,000 psi, impact energy of 30-72 ft. lbs. and a tensile strength of 800-1,100 psi. 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. over a 10" 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).

Types 11, 14, and 15 are precast polymer frame and lids installed on a precast concrete base. Precast polymer concrete frame and lids shall be the heavy-duty nonconductive type with a design load of 15,000 lbs. over a 10" square. The coefficient of friction should be greater than 0.5. The precast polymer concrete lid logo shall bear the inscription "DelDOT ELECTRIC"(Types 11, 14, and 15)

Construction Methods:

The conduit junction well shall conform to the dimensions shown on the Standard Construction or applicable Plan Details, 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, pedestrian curb ramps, 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 applicable plan sheets or Standard Construction Details. A stone base shall be built for all types of junction wells. Grounding and bonding of the units shall be performed as shown on the plans or Standard Construction details.

Method of Measurement:

The quantity of junction wells shall be the actual number of conduit junction wells by type, that are supplied, constructed, complete in place, and accepted, including cast iron frames and lids with grounding lugs, precast polymer concrete frame and covers, or precast polymer concrete covers, stone base, bonding, grounding, and splicing if required. 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 or applicable Plan 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, backfilling, and stone base. Price and payment will constitute full compensation for all labor, equipment, tools, and incidentals required to complete the work.

2/29/12

745508 - BRIDGE-MOUNTED CONDUIT

Description:

This work shall consist of furnishing and installing 4" diameter PVC multi-duct conduit, 2" and 3" diameter PVC conduit on bridge structures.

Materials:

Structural Steel	-	A36 (hot-dipped galvanized)
Expansion Anchors	-	Stainless Steel
U-Bolts	-	Stainless Steel
4" PVC Multi-duct	-	See Traffic section of the Special Provisions
3" PVC Conduit	-	Schedule 80
2" PVC Conduit	-	Schedule 80

Construction Methods:

Expansion anchors shall be installed in strict conformance with the manufacturer's recommendations. Anchors shall not be installed within one foot of the edge of a deck joint. Any damage to the galvanized coating of the supports shall be repaired.

Expansion joints shall be installed in both conduits and at expansion joints in the bridge.

Measurement and Payment:

The length of bridge-mounted conduit to be paid for under this section shall not be measured. The actual length of conduit specified in the Plans or as directed by the Engineer, and constructed according to these specifications, shall be paid for on a lump sum basis, complete, in place, and accepted.

Basis of Payment:

The length of Bridge-Mounted Conduit, as determined above, shall be paid for at the Contract lump sum price bid for "Bridge-Mounted Conduit," which price and payment shall include all conduit, structural steel, U-bolts, expansion anchors, and all other materials, labor, equipment, tools and incidentals necessary to complete the work.

NOTE:

On a breakout sheet attached to the Bid Proposal, the Contractor shall list the price for each Bridge Mounted Conduit installation. The lump sum bid for this item shall be the sum of the prices for all Bridge Mounted Conduit installations.

The Department reserves the right to delete from the Contract, construction of one or more of the individual Bridge Mounted Conduit installation(s), and the lump sum to be paid will be reduced in accordance with the amount listed on the breakout sheet for the particular Bridge Mounted Conduit installation(s) deleted. There will be no extra compensation to the Contractor if such a deletion is made.

8/12/15

745601 – FURNISH & INSTALL UP TO 3" FLEXIBLE METALLIC-LIQUIDTIGHT CONDUIT
745602 - FURNISH & INSTALL UP TO 4" SCHEDULE 80 HDPE CONDUIT (BORE)
745603 - FURNISH & INSTALL UP TO 4" SCHEDULE 80 PVC CONDUIT (OPEN CUT)
745604 - FURNISH & INSTALL UP TO 4" SCHEDULE 80 PVC CONDUIT (TRENCH)
745605 - FURNISH & INSTALL UP TO 4" SCHEDULE 80 PVC CONDUIT (ON STRUCTURE)
745606 - FURNISH & INSTALL UP TO 4" GALVANIZED STEEL CONDUIT (TRENCH)
745607 - FURNISH & INSTALL UP TO 4" GALVANIZED STEEL CONDUIT (BORE)
745608 - FURNISH & INSTALL UP TO 4" GALVANIZED STEEL CONDUIT (OPEN CUT)
745609 - FURNISH & INSTALL UP TO 4" GALVANIZED STEEL CONDUIT (ON STRUCTURE)
745610 - FURNISH & INSTALL UP TO 4" NONMETALLIC POLE RISER SHIELD

Description:

Furnish and install HDPE, PVC, or Galvanized steel conduits of any size less than or equal to 4 inches in diameter (3 inches or less for Flexible Metallic Liquidtight Conduit) as described below.

Materials:

All conduits shall be UL listed.

HDPE Conduit - 4" or less diameter, high density polyethylene (HDPE) schedule 80, smooth wall conduit with permanently pre-lubricated lining, meeting ASTM D2447, ASTM D3035 and NEMA TC7 specifications.

PVC Conduit - 4" or less diameter, schedule 80 rigid polyvinyl chloride (PVC) conduit, meeting Commercial Standard CS-272-65 (PVC), ASTM D-1785 and U.C. Standard 651 specifications.

Galvanized Steel Conduit - 4" or less diameter, rigid galvanized steel conduit meeting National Electric Code 2002, Article 344.

Nonmetallic Pole Riser Shield – 4" diameter or less nonmetallic pole riser shield with belled ends meeting NEMA TC-19 specifications.

Flexible Metallic-Liquidtight Conduit – meets National Electric Code 2002, Article 350

Weatherhead for galvanized or PVC conduit – material shall match the adjoining conduit

Insulated grounding bushing with knockouts - meet or exceed UL 514 B

Condulets for conduit sizes - material shall match the adjoining conduit

Anchors - A 307, Galvanized per A 153

One hole conduit hangers - Steel City Series 6H or 6H-B, CADDY CD3B Rigid Conduit Hanger, or approved equal

End caps - material shall match the adjoining conduit

LONG sweep sections for conduit sizes - material shall match the adjoining conduit, and shall be manufactured 90 degree sweeping bends.

Construction Methods:

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

Conduit installed underground shall be installed in a straight line between terminal points. In straight runs, junction well spacing shall be no more than 600 feet for fiber optic conduit or no more than 300 feet for copper in conduit, or as directed by the Engineer. If bends are required during installation, they must be manufactured sweeping bends. The Engineer will be consulted before any bends are installed to ensure that the proper arc is provided.

Conduit shall have a minimum cover as measured from the finished grade of 24 inches and a maximum cover of 48 inches.

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

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

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

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

Using conduit tools, rigid metallic conduit shall be cut, reamed, and threaded. The thread length shall be as necessary to ensure that the sections of conduits when screwed into a coupling and tightened correctly will butt together and the joint will be watertight. A three-piece threaded union, as approved by the Engineer, shall be used to join two threaded lengths of conduit in the case where a standard coupling will not work. A threaded union shall not be used in a conduit run that is to be driven. At no time is a threadless coupling or a split-bolt coupling to be used for direct buried conduit.

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

All lengths of PVC conduit shall be connected by one conduit end fitting inside the flared end of the other conduit section. If this is not possible, then a coupling may be used. Regardless of how connection is made, all joints shall be sealed with the appropriate epoxy to ensure that the two conduit pieces bond to one another to form a solid waterproof link. Using conduit tools, the conduit shall be cut and prepared. If approved by the Engineer, a coupler module may be used where conduit segments do not align properly to allow the flared end of one conduit segment to mate with the normal end of the other segment.

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

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

All PVC and HDPE conduits shall have a continuous metallic trace wire installed for the entire length of the conduit run for all fiber installations.

Installation Of Conduit Under Existing Pavement, Directional Bore -

Directional bore shall be used for installation of conduits under existing pavement with a conduit diameter not less than 1-1/2". The size of a bore shall not exceed the outside diameter of the conduit by more than 1 inch. If it does, cement grout shall be pumped into the void. **Only HDPE and/or Galvanized Steel conduit may be installed by Directional Bore methods.**

Installation Of Conduit Under Existing Pavement, Open Cut -

Installation by sawcutting the full pavement depth and removing the existing pavement with an excavator or by hand methods, shall be used only for conduits not less than 1-1/2" diameter. The Engineer must first approve all open cutting of roadways. The width and length of open cut and patch restoration materials shall be as shown on the plan details. The Contractor shall be responsible for the removal of all cut pavement and surplus excavation, and for the replacement and correction of any damaged pavement outside the sawcut limits after the conduit(s) are installed. Asphalt pavement, concrete, base course, sawcutting, and/or borrow from an outside source as required to restore the roadway will be paid for separately under their respective bid items.

Installation Of Conduit Under New Pavement, Unpaved Trench -

Trenching or other approved method shall be used for installation of conduit in unpaved trench or under new pavement. Backfill in conduit trenches shall be compacted thoroughly as it is being placed. At the discretion of the Engineer, sod, that must be removed for the placement of conduit, shall be removed either by the use of an approved sod cutter and then replaced, or 6 inches of topsoil shall be placed and the surface seeded in accordance with Section 908 - Seeding. In areas where new pavement is to be placed or in areas where total reconstruction is taking place, sodding or seeding may not be required by the Engineer. Sodding and/or topsoil from an outside source if required will be paid for separately under their respective bid items. Seeding is considered incidental to the conduit item.

Installation Of Conduit On Structure -

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

Installation of Nonmetallic Riser Shield or Flexible Metallic Liquidtight Conduit -

Riser Shield and/or Flexible Metallic Liquidtight Conduit installed on wood poles, metal poles, structures, and/or mast arms shall be installed in a straight line. The conduit, when attached to poles, shall be attached with 2-hole straps spaced not more than 36 inches apart with the top-most strap being 12 inches from the weatherhead and the lower-most being 12 inches from the condulet. A weatherhead matching the diameter of the conduit shall be installed on the upper end of the conduit. A condulet of the same size as the conduit being installed, but not smaller than 2 inches shall be placed 48 inches above finished grade. Install two, 2-hole straps of the proper size, evenly spaced below the condulet. Nonmetallic pole risers (U-guard) shall be installed on poles to allow interduct to be connected directly to messenger cable. The underground conduit shall be as close to the base of the pole as possible. If the nonmetallic pole riser or metallic liquidtight conduit is not the same size as the conduit, an adapter shall be used at no additional cost to the Department. The nonmetallic pole riser or metallic liquidtight conduit shall be attached to the pole with 1/4" x 1-1/2" galvanized lag bolts with washers. Lag bolts will be used every 36 inches on BOTH sides of the nonmetallic pole riser or liquidtight conduit, and in the top most and bottom most set of slots. Flexible metallic liquidtight conduit shown on the plans to be installed on mast arms or on metal structure shall also include stainless steel banding placed at a maximum of 5 feet intervals.

Method of Measurement:

The quantity of conduit or riser shield installed as specified, shall be measured as the number of linear feet of each conduit or riser shield installed as specified, complete in place, and accepted.

The length of each conduit installed under existing pavement by a directional bore or by open cutting the pavement shall be measured along the path of the bore or open cut, from the point that cannot be trenched to the point that trenching can resume. The length of any conduit that is reduced or divided (with a junction well or conduit body) shall be measured as part of the larger conduit.

Basis of Payment:

The quantity of conduit or riser shield will be paid for at the Contract unit price per linear foot. Price and payment shall include full compensation for furnishing all conduit and/or riser shield materials, equipment, labor, and incidentals necessary to complete the item.

For conduit installed by Directional Bore, the linear foot payment also includes excavation and backfilling for Bore Equipment, placing the conduit, caps if required, and all other requirements and incidentals listed in the body of this specification.

For conduit installed by Open Cutting existing pavement, the linear foot payment also includes excavating, backfilling, placing the conduit, disposal of excess materials, and all other requirements and incidentals listed in the body of this specification.

For conduit installed in an Unpaved Trench, the linear foot payment also includes excavating, removal of sod if required, backfilling, placing the conduit, disposal of excess materials, replacing excavated on-site sod if required, seeding if required, and all other requirements and incidentals listed in the body of this specification. Sod and/or topsoil furnished from an outside source, will be paid for separately.

For conduit installed on a structure, the linear foot payment also includes furnishing and installing anchors and hangers, removal of excess materials, and all other requirements and incidentals listed in the body of this specification.

For riser shield or flexible metallic conduit installed on poles, mast arms, or structures the linear foot payment also includes furnishing and installing straps, weatherhead, condulet, lag bolts and washers, any other required mounting hardware, and all other requirements and incidentals listed in the body of this specification.

7/20/15

746559 - BRIDGE LIGHTING AND POWER

Description:

This item consists of the fabrication, supply, and installation of electrical power and lighting equipment required for the illumination of a pedestrian bridge, as shown and described on the Plans, as directed by the Engineer, and as required by these Special Provisions.

Item Subsections:

260519 LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
260526 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
260529 HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
260533 RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS
260544 SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING
260553 IDENTIFICATION FOR ELECTRICAL SYSTEMS
262200 LOW-VOLTAGE TRANSFORMERS
262416 PANELBOARDS
262816 ENCLOSED SWITCHES AND CIRCUIT BREAKERS
265619 EXTERIOR LIGHTING

Item Requirements:

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper building wire rated 600 V or less.
2. Connectors, splices, and terminations rated 600 V and less.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Product Schedule: Indicate type, use, location, and termination locations.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE

A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.
B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cerro Wire LLC.
2. Encore Wire Corporation.
3. General Cable Technologies Corporation.
4. Southwire Company.

C. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. RoHS compliant.
3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.

E. Conductor Insulation:
1. Type THHN and Type THWN-2: Comply with UL 83.
2. Type XHHW-2: Comply with UL 44.

2.2 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. 3M Electrical Products.
2. Hubbell Power Systems, Inc.
3. O-Z/Gedney; a brand of Emerson Industrial Automation.
4. Thomas & Betts Corporation; A Member of the ABB Group.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.
B. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway.
C. Exposed Branch Circuits, Including in Crawlspaces: Type XHHW-2, single conductors in raceway.
D. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
E. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated wall assemblies to restore original fire-resistance rating of assembly.

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 4 - GENERAL

4.1 SUMMARY

A. Section includes grounding and bonding systems and equipment, plus the following special applications:

1. Underground distribution grounding.

4.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

4.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency and testing agency's field supervisor.
B. Field quality-control reports.

4.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Certified by NETA.

PART 5 - PRODUCTS

5.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

5.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ERICO International Corporation.
2. Harger Lightning & Grounding.
3. O-Z/Gedney; a brand of Emerson Industrial Automation.
4. Thomas & Betts Corporation; A Member of the ABB Group.

5.3 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

5.4 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

5.5 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet.
B. Ground Plates: 1/4 inch thick, hot-dip galvanized.

PART 6 - EXECUTION

6.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2/0 AWG minimum.\

1. Bury at least 24 inches below grade.

C. Conductor Terminations and Connections:

1. Underground Connections: Welded connectors except at test wells and as otherwise indicated.

6.2 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

6.3 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.
B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Lighting circuits.
2. Receptacle circuits.

6.4 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.

C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

6.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.
B. Tests and Inspections:
1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at individual ground rods. Make tests at ground rods before any conductors are connected.
a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
b. Perform tests by fall-of-potential method according to IEEE 81.

C. Grounding system will be considered defective if it does not pass tests and inspections.
D. Prepare test and inspection reports.
E. Report measured ground resistances that exceed the following values:
1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Engineer promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 7 - GENERAL

7.1 SUMMARY

A. Section Includes:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

7.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

7.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

PART 8 - PRODUCTS

8.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Conduit and Cable Support Devices: Stainless-steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
B. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M steel plates, shapes, and bars; black and galvanized.
C. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) B-line, an Eaton business.
2) Hilti, Inc.
3) ITW Ramset/Red Head; Illinois Tool Works, Inc.
4) MKT Fastening, LLC.

2. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
3. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
5. Toggle Bolts: Stainless-steel springhead type.

8.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

PART 9 - EXECUTION

9.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems unless requirements in this Section are stricter.
B. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."
C. Maximum Support Spacing for Raceway: Space supports for EMTs, IMCs, and RMCs as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

9.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.
B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements.
D. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

9.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
B. Field Welding: Comply with AWS D1.1/D1.1M.

9.4 PAINTING

A. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 10 - GENERAL

10.1 SUMMARY

A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Surface raceways.
4. Boxes, enclosures, and cabinets.
5. Handholes and boxes for exterior underground cabling.

B. Related Requirements:

1. Section 260543 "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks, manholes, and underground utility construction.

10.2 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

PART 11 - PRODUCTS

11.1 METAL CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Allied Tube & Conduit; a part of Atkore International.
2. FSR Inc.

3. O-Z/Gedney; a brand of Emerson Industrial Automation.
4. Robroy Industries.
5. Southwire Company.
6. Thomas & Betts Corporation; A Member of the ABB Group.
7. Wheatland Tube Company.

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch, minimum.

D. EMT: Comply with ANSI C80.3 and UL 797.
E. FMC: Comply with UL 1; **[zinc-coated steel] [or] [aluminum]**.
F. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
G. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Fittings for EMT:
   a. Material: Steel.
   b. Type: Compression.

2. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.

3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

11.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CertainTeed Corporation.
2. Condux International, Inc.
3. Electri-Flex Company.
4. RACO; Hubbell.
5. Thomas & Betts Corporation; A Member of the ABB Group.

B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Solvents and Adhesives: As recommended by conduit manufacturer.

11.3 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hoffman; a brand of Pentair Equipment Protection.
2. Hubbell Incorporated.
3. Robroy Industries.
4. Thomas & Betts Corporation; A Member of the ABB Group.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
F. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.
G. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 3R with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

H. Cabinets:

1. NEMA 250, Type 3R galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

11.4 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. Refer to DelDot requirements for Type 11 junction wells.

PART 12 - EXECUTION

12.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: RNC, Type EPC-80-PVC.
2. Underground Conduit: RNC, Type EPC-80-PVC, direct buried.
3. Boxes and Enclosures, Aboveground: NEMA 250, Type 4X.

B. Indoors: Apply raceway products as specified below unless otherwise indicated.

1. Exposed, Not Subject to Physical Damage: EMT.
2. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
3. Damp or Wet Locations: IMC.
4. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

C. Minimum Raceway Size: 1/2-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.

2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.

3. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.
4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

F. Install surface raceways only where indicated on Drawings.
G. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

12.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
C. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.
D. Arrange stub-ups so curved portions of bends are not visible above finished slab.
E. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.
F. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
G. Support conduit within 12 inchesof enclosures to which attached.
H. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot intervals.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
3. Arrange raceways to keep a minimum of 2 inches of concrete cover in all directions.
4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.

I. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
J. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
K. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
L. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
M. Surface Raceways:

1. Install surface raceway with a minimum 2-inchradius control at bend points.
2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

N. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces.
O. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service raceway enters a building or structure.
3. Where otherwise required by NFPA 70.

P. Expansion-Joint Fittings:

1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet.
2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
   a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
   b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
   c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per degree F of temperature change for PVC conduits.
4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

Q. Locate boxes so that cover or plate will not span different finishes.
R. Fasten junction and pull boxes to or support from structure. Do not support boxes by conduits.

12.3 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior wall assemblies to maintain existing fire rating.

12.4 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

12.5 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 13 - GENERAL

13.1 SUMMARY

A. Section Includes:

1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

13.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 14 - PRODUCTS

14.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. Sleeves for Rectangular Openings:
1. Material: Galvanized sheet steel.
2. Minimum Metal Thickness:
a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.
b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

14.2 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Hilti.
b. HOLDRITE.

14.3 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

14.4 SILICONE SEALANTS

A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.
1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 15 - EXECUTION

15.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:
1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

15.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

15.3 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 260544

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 16 - GENERAL

16.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

16.2 SUMMARY

A. Section Includes:

1. Color and legend requirements for raceways, conductors, and warning labels and signs.
2. Labels.
3. Bands and tubes.
4. Tapes and stencils.
5. Tags.
6. Signs.
7. Cable ties.
8. Paint for identification.
9. Fasteners for labels and signs.

16.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Samples: For each type of label and sign to illustrate composition, size, colors, lettering style, mounting provisions, and graphic features of identification products.

PART 17 - PRODUCTS

17.1 PERFORMANCE REQUIREMENTS

A. Comply with ASME A13.1.
B. Comply with NFPA 70.
C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
D. Comply with ANSI Z535.4 for safety signs and labels.
E. Comply with NFPA 70E requirements for arc-flash warning labels.
F. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.
G. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
   1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

17.2 COLOR AND LEGEND REQUIREMENTS

A. Raceways and Cables Carrying Circuits at 600 V or Less:
   1. Black letters on an orange field.
   2. Legend: Indicate voltage and system or service type.

B. Color-Coding for Phase- and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded feeder and branch-circuit conductors.
   1. Color shall be factory applied or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit.

   2. Colors for 208/120-V Circuits:
      a. Phase A: Black.
      b. Phase B: Red.
      c. Phase C: Blue.

   3. Colors for 480/277-V Circuits:
      a. Phase A: Brown.
      b. Phase B: Orange.
      c. Phase C: Yellow.

   4. Color for Neutral: White.
   5. Color for Equipment Grounds: Green.
   6. Colors for Isolated Grounds: Green with white stripe.

C. Warning Label Colors:
   1. Identify system voltage with black letters on an orange background.

D. Warning labels and signs shall include, but are not limited to, the following legends:
   1. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

17.3 LABELS

A. Snap-around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameter and that stay in place by gripping action.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Brady Corporation.
      b. HellermannTyton.
      c. Marking Services, Inc.

d. Panduit Corp.
e. Seton Identification Products.

17.4 TAPES AND STENCILS

A. Underground-Line Warning Tape:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Brady Corporation.
   b. Ideal Industries, Inc.
   c. LEM Products Inc.
   d. Marking Services, Inc.
   e. Reef Industries, Inc.
   f. Seton Identification Products.

2. Tape:
   a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
   b. Printing on tape shall be permanent and shall not be damaged by burial operations.
   c. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.
3. Color and Printing:
   a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.
   b. Inscriptions for Orange-Colored Tapes: COMMUNICATIONS CABLE.
4. Tag: Type ID:
   a. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core; bright colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
   b. Width: 3 inches.
   c. Overall Thickness: 5 mils.
   d. Foil Core Thickness: 0.35 mil.
   e. Weight: 28 lb/1000 sq. ft..
   f. Tensile according to ASTM D 882: 70 lbf and 4600 psi.

B. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch.

17.5 CABLE TIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Ideal Industries, Inc.
   2. Marking Services, Inc.
   3. Panduit Corp.

B. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 Deg F according to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black, except where used for color-coding.

17.6 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 18 - EXECUTION

18.1 INSTALLATION

A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.
B. Install identifying devices before installing acoustical ceilings and similar concealment.
C. Verify identity of each item before installing identification products.
D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.
E. Apply identification devices to surfaces that require finish after completing finish work.
F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.
G. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.
H. System Identification for Raceways and Cables under 600 V: Identification shall completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.

    1. Secure tight to surface of conductor, cable, or raceway.

I. System Identification for Raceways and Cables over 600 V: Identification shall completely encircle cable or conduit. Place adjacent identification of two-color markings in contact, side by side.

    1. Secure tight to surface of conductor, cable, or raceway.

J. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
K. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.
L. Accessible Fittings for Raceways: Identify the covers of each junction and pull box of the following systems with the wiring system legend and system voltage. System legends shall be as follows:
    1. "POWER."

M. Snap-around Labels: Secure tight to surface at a location with high visibility and accessibility.
N. Snap-around Color-Coding Bands: Secure tight to surface at a location with high visibility and accessibility.
O. Underground Line Warning Tape:
    1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches overall.
    2. Limit use of underground-line warning tape to direct-buried cables.
    3. Install underground-line warning tape for direct-buried cables and cables in raceways.
P. Cable Ties: General purpose, for attaching tags.

18.2 IDENTIFICATION SCHEDULE

A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.
B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.
C. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Feeder and Branch Circuits, More Than 30 A and 120 V to Ground: Identify with self-adhesive raceway labels.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

D. Accessible Fittings for Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive labels containing the wiring system legend and system voltage. System legends shall be as follows:
   1. "POWER."

E. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use snap-around labels to identify the phase.
   1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

F. Locations of Underground Lines: Underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.

G. Instructional Signs: Self-adhesive labels, including the color code for grounded and ungrounded conductors.

H. Warning Labels for Indoor/Outdoor Cabinets, Boxes, and Enclosures for Power and Lighting: Baked-enamel warning signs.
   1. Apply to exterior of door, cover, or other access.

I. Arc Flash Warning Labeling: Self-adhesive labels.

J. Operating Instruction Signs: Baked-enamel warning signs.

K. Equipment Identification Labels:
   1. Indoor Equipment: Baked-enamel signs.
   2. Outdoor Equipment: Laminated acrylic or melamine sign.

END OF SECTION 260553

SECTION 260923 - LIGHTING CONTROL DEVICES

PART 19 - GENERAL

19.1 PHOTOELECTRCIC CONTROLS

A. Photoelectric controls shall be solid state, cadmium sulfide type with hermetically sealed silicone rectifier rated 120/240 or 277 volts, 60 cycle AC and 1000 watts maximum load. Built in surge protection shall be provided, and a failsafe operating feature shall be included so that the lighting circuits will remain energized in the event the photo control components become inoperative. Nominal operating levels of this control shall turn on at a minimum vertical illumination value of 3 FC (32 lux) and turn off at a maximum vertical illumination value of 6 FC (65 lux). These limitations shall be set by the manufacturer, and tolerances of plus or minus 20 percent for the specified value will be acceptable. Photoelectric controls for luminaires and lighting controls shall be twist lock type. A suitable mounting bracket with locking type receptacle and all other necessary mounting hardware shall be furnished.

19.2 CONTACTORS AND RELAYS

A. Contactors of the current ratings and number of poles specified in the Contract Documents shall be held by permanent magnets. They shall be fully rated for all classes of load to 600 volts AC and shall have an interrupting rating of 600 percent of rated current. A HAND-OFF-AUTOMATIC selector switch shall be provided in the photoelectric cell circuit. Relays shall be the type, size and contact rating as specified in the Contract Documents.

END OF SECTION 260923

SECTION 262200 - LOW-VOLTAGE TRANSFORMERS

PART 20 - GENERAL

20.1 SUMMARY

A. Section Includes: Distribution, dry-type transformers rated 600 V and less, with capacities up to 1500 kVA.

20.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Shop Drawings:
   1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment.
   3. Include diagrams for power, signal, and control wiring.

20.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.
B. Source quality-control reports.
C. Field quality-control reports.

20.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

20.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Accredited by NETA.
   1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

20.6 DELIVERY, STORAGE, AND HANDLING

A. Temporary Heating: Apply temporary heat according to manufacturer's written instructions.

PART 21 - PRODUCTS

21.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Eaton.
   2. General Electric Company.
   3. Siemens Power Transmission & Distribution, Inc.
   4. Square D; by Schneider Electric.

21.2 GENERAL TRANSFORMER REQUIREMENTS

A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.
B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
C. Transformers Rated 15 kVA and Larger: Comply with NEMA TP 1 energy-efficiency levels as verified by testing according to NEMA TP 2.
   1. Coil Material: Copper.

D. Encapsulation: Transformers smaller than 30 kVA shall have core and coils completely resin encapsulated.

21.3 DISTRIBUTION TRANSFORMERS

A. Comply with NFPA 70, and list and label as complying with UL 1561.
B. Cores: One leg per phase.
C. Transformer Enclosure Finish: Comply with NEMA 250.

1. Finish Color: Gray .

D. Taps for Transformers 7.5 to 24 kVA: One 5 percent tap above and one 5 percent tap below normal full capacity.
E. Insulation Class, Smaller than 30 kVA: 185 deg C, UL-component-recognized insulation system with a maximum of 115-deg C rise above 40-deg C ambient temperature.
F. Wall Brackets: Manufacturer's standard brackets.

21.4 IDENTIFICATION DEVICES

A. Nameplates: Engraved, laminated-plastic or metal nameplate for each distribution transformer, mounted with corrosion-resistant screws. Nameplates and label products are specified in Section 260553 "Identification for Electrical Systems."

21.5 SOURCE QUALITY CONTROL

A. Test and inspect transformers according to IEEE C57.12.01 and IEEE C57.12.91.

PART 22 - EXECUTION

22.1 INSTALLATION

A. Verify that ground connections are in place and requirements in Section 260526 "Grounding and Bonding for Electrical Systems" have been met. Maximum ground resistance shall be 5 ohms at location of transformer.

B. Environment: Enclosures shall be rated for the environment in which they are located. Covers for NEMA 250, Type 4X enclosures shall not cause accessibility problems.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

D. Install wall-mounted transformers level and plumb with wall brackets fabricated by transformer manufacturer.

1. Coordinate installation of wall-mounted and structure-hanging supports with actual transformer provided.

E. Secure covers to enclosure and tighten all bolts to manufacturer-recommended torques to reduce noise generation.

F. Remove shipping bolts, blocking, and wedges.

22.2 CONNECTIONS

A. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
B. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
D. Provide flexible connections at all conduit and conductor terminations and supports to eliminate sound and vibration transmission to the building structure.

22.3 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS for dry-type, air-cooled, low-voltage transformers. Certify compliance with test parameters.

B. Remove and replace units that do not pass tests or inspections and retest as specified above.
C. Infrared Scanning: Two months after Substantial Completion, perform an infrared scan of transformer connections.
   1. Use an infrared-scanning device designed to measure temperature or detect significant deviations from normal values. Provide documentation of device calibration.
   2. Perform two follow-up infrared scans of transformers, one at four months and the other at 11 months after Substantial Completion.
   3. Prepare a certified report identifying transformer checked and describing results of scanning. Include notation of deficiencies detected, remedial action taken, and scanning observations after remedial action.

22.4 ADJUSTING

A. Record transformer secondary voltage at each unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 5 percent and not being lower than nameplate voltage minus 3 percent at maximum load conditions. Submit recording and tap settings as test results.
B. Output Settings Report: Prepare a written report recording output voltages and tap settings.

END OF SECTION 262200

SECTION 262416 - PANELBOARDS

PART 23 - GENERAL

23.1 SUMMARY
A. Section Includes:

   1. Distribution panelboards.
   2. Lighting and appliance branch-circuit panelboards.

23.2 DEFINITIONS

A. MCCB: Molded-case circuit breaker.

B. SPD: Surge protective device.

23.3 ACTION SUBMITTALS

A. Product Data: For each type of panelboard.

B. Shop Drawings: For each panelboard and related equipment.

   1. Include dimensioned plans, elevations, sections, and details.
   2. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
   3. Detail bus configuration, current, and voltage ratings.
   4. Short-circuit current rating of panelboards and overcurrent protective devices.
   5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
   6. Include wiring diagrams for power, signal, and control wiring.
   7. Key interlock scheme drawing and sequence of operations.
   8. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards.

23.4 INFORMATIONAL SUBMITTALS

A. Panelboard schedules for installation in panelboards.

23.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

23.6 FIELD CONDITIONS

A. Service Conditions: NEMA PB 1, usual service conditions, as follows:
   1. Ambient temperatures within limits specified.
   2. Altitude not exceeding 6600 feet.

23.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.
   1. Panelboard Warranty Period: 12 months from date of Substantial Completion.

PART 24 - PRODUCTS

24.1 PANELBOARDS COMMON REQUIREMENTS

A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Section 260548.16 "Seismic Controls for Electrical Systems."
B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
C. Comply with NEMA PB 1.
D. Comply with NFPA 70.
E. Enclosures: Surface-mounted, dead-front cabinets.
   1. Rated for environmental conditions at installed location.
      a. Outdoor Locations: NEMA 250, Type 3R.
   2. Height: 84 inches maximum.
   3. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims shall cover all live parts and shall have no exposed hardware.
   4. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.
F. Incoming Mains Location: Top.
G. Phase, Neutral, and Ground Buses: Hard-drawn copper, 98 percent conductivity.
H. Conductor Connectors: Suitable for use with conductor material and sizes.
   1. Material: Hard-drawn copper, 98 percent conductivity.
   2. Main and Neutral Lugs: Compression type, with a lug on the neutral bar for each pole in the panelboard.
   3. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.

I. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.

24.2 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Eaton.
   2. General Electric Company; GE Energy Management - Electrical Distribution.
   3. Siemens Energy.
   4. Square D; by Schneider Electric.

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
C. Mains: Circuit breaker.
D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

24.3 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Eaton.
   2. General Electric Company; GE Energy Management - Electrical Distribution.
   3. Siemens Energy.
   4. Square D; by Schneider Electric.

B. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.
   1. Thermal-Magnetic Circuit Breakers:
      a. Inverse time-current element for low-level overloads.
      b. Instantaneous magnetic trip element for short circuits.
      c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

   2. MCCB Features and Accessories:
      a. Standard frame sizes, trip ratings, and number of poles.
      b. Breaker handle indicates tripped status.
      c. UL listed for reverse connection without restrictive line or load ratings.
      d. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
      e. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and HID lighting circuits.

24.4 IDENTIFICATION

A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.
B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.
C. Circuit Directory: Directory card inside panelboard door, mounted in metal frame with transparent protective cover.

24.5 ACCESSORY COMPONENTS AND FEATURES

A. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

PART 25 - EXECUTION

25.1 INSTALLATION

A. Comply with NECA 1.
B. Install panelboards and accessories according to NEMA PB 1.1.
C. Mount panelboard cabinet plumb and rigid without distortion of box.
D. Install overcurrent protective devices and controllers not already factory installed.
E. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes and connections to separate ground bars.
F. Install filler plates in unused spaces.
G. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

25.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems."
B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
D. Device Nameplates: Label each branch circuit device in power panelboards with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
E. Install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems" identifying source of remote circuit.

25.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.
B. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Panelboards will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results, with comparisons of the two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION 262416

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 26 - GENERAL

26.1 SUMMARY

A. Section Includes:

1. Molded-case circuit breakers (MCCBs).
2. Enclosures.

26.2 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

1. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Provide in PDF electronic format.

B. Shop Drawings: For enclosed switches and circuit breakers.

1. Include plans, elevations, sections, details, and attachments to other work.
2. Include wiring diagrams for power, signal, and control wiring.

26.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.
B. Field quality-control reports.

26.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

26.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Accredited by NETA.
   1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

26.6 WARRANTY

A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: One year from date of Substantial Completion.

PART 27 - PRODUCTS

27.1 GENERAL REQUIREMENTS

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single manufacturer.
B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
C. Comply with NFPA 70.

27.2 MOLDED-CASE CIRCUIT BREAKERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   1. Eaton.
   2. General Electric Company.
   3. Siemens Industry, Inc.
   4. Square D; by Schneider Electric.

B. Circuit breakers shall be constructed using glass-reinforced insulating material. Current carrying components shall be completely isolated from the handle and the accessory mounting area.

C. Circuit breakers shall have a toggle operating mechanism with common tripping of all poles, which provides quick-make, quick-break contact action. The circuit-breaker handle shall be over center, be trip free, and reside in a tripped position between on and off to provide local trip indication. Circuit-breaker escutcheon shall be clearly marked on and off in addition to providing international I/O markings. Equip circuit breaker with a push-to-trip button, located on the face of the circuit breaker to mechanically operate the circuit-breaker tripping mechanism for maintenance and testing purposes.

D. The maximum ampere rating and UL, IEC, or other certification standards with applicable voltage systems and corresponding interrupting ratings shall be clearly marked on face of circuit breaker. Circuit breakers shall be 100 percent rated. combinations for series connected interrupting ratings shall be listed by UL as recognized component combinations. Any series rated combination used shall be marked on the end-use equipment along with the statement "Caution - Series Rated System. _____ Amps Available. Identical Replacement Component Required."
E. MCCBs shall be equipped with a device for locking in the isolated position.
F. Lugs shall be suitable for 167 deg F rated wire.

G. Standards: Comply with UL 489 and NEMA AB 3, with interrupting capacity to comply with available fault currents.
H. Thermal-Magnetic Circuit Breakers: Inverse time-current thermal element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
I. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
J. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:
    1. Long- and short-time pickup levels.
    2. Long- and short-time time adjustments.
    3. Ground-fault pickup level, time delay, and I-squared t response.

K. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.
L. Features and Accessories:
    1. Standard frame sizes, trip ratings, and number of poles.
    2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
    3. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.

27.3 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: UL 489, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
B. Enclosure Finish: The enclosure shall be finished with a brush finish on Type 304 stainless steel (NEMA 250 Type 4-4X stainless steel).
C. Conduit Entry: NEMA 250 Types 4, 4X, and 12 enclosures shall contain no knockouts. NEMA 250 Types 7 and 9 enclosures shall be provided with threaded conduit openings in both endwalls.
D. Operating Mechanism: The circuit-breaker operating handle shall be externally operable with the operating mechanism being an integral part of the box, not the cover. The cover interlock mechanism shall have an externally operated override. The override shall not permanently disable the interlock mechanism, which shall return to the locked position once the override is released. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.
E. Enclosures designated as NEMA 250 Type 4, 4X stainless steel, 12, or 12K shall have a dual cover interlock mechanism to prevent unintentional opening of the enclosure cover when the circuit breaker is ON and to prevent turning the circuit breaker ON when the enclosure cover is open.

27.4 ENCLOSURE ENVIRONMENTAL RATING APPLICATIONS

A. Enclosed Switches and Circuit Breakers: Provide enclosures at installed locations with the following environmental ratings.
    1. Outdoor Locations: NEMA 250, Type 4X.

27.5 INSTALLATION

A. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

    1. Notify Owner no fewer than 10 days in advance of proposed interruption of electric service.
    2. Indicate method of providing temporary electric service.
    3. Do not proceed with interruption of electric service without Owner's written permission.
    4. Comply with NFPA 70E.

B. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
C. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
D. Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
E. Install fuses in fusible devices.
F. Comply with NFPA 70 and NECA 1.
G. Set field-adjustable circuit-breaker trip ranges to values indicated on the Drawings.

27.6 IDENTIFICATION

A. Comply with requirements in Section 260553 "Identification for Electrical Systems."
   1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
   2. Label each enclosure with engraved metal or laminated-plastic nameplate.

27.7 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
C. Perform tests and inspections.
D. Tests and Inspections for Molded Case Circuit Breakers:

   1. Visual and Mechanical Inspection:

      a. Verify that equipment nameplate data are as described in the Specifications and shown on the Drawings.
      b. Inspect physical and mechanical condition.
      c. Inspect anchorage, alignment, grounding, and clearances.
      d. Verify that the unit is clean.
      e. Operate the circuit breaker to ensure smooth operation.
      f. Inspect bolted electrical connections for high resistance using one of the two following methods:

         1) Use a low-resistance ohmmeter.

            a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

         2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.

            a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.

      g. Inspect operating mechanism, contacts, and chutes in unsealed units.
      h. Perform adjustments for final protective device settings in accordance with the coordination study.

   2. Electrical Tests:

      a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.

b. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with circuit breaker closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.

c. Perform a contact/pole resistance test. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.

d. Perform insulation resistance tests on all control wiring with respect to ground. Applied potential shall be 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable. Test duration shall be one minute. For units with solid state components, follow manufacturer's recommendation. Insulation resistance values shall be no less than two megohms.

e. Determine the following by primary current injection:

1) Long-time pickup and delay. Pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
2) Short-time pickup and delay. Short-time pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
3) Ground-fault pickup and time delay. Ground-fault pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
4) Instantaneous pickup. Instantaneous pickup values shall be as specified and within manufacturer's published tolerances.

f. Test functionality of the trip unit by means of primary current injection. Pickup values and trip characteristics shall be as specified and within manufacturer's published tolerances.

g. Perform minimum pickup voltage tests on shunt trip and close coils in accordance with manufacturer's published data. Minimum pickup voltage of the shunt trip and close coils shall be as indicated by manufacturer.

h. Verify correct operation of auxiliary features such as trip and pickup indicators; zone interlocking; electrical close and trip operation; trip-free, anti-pump function; and trip unit battery condition. Reset all trip logs and indicators. Investigate units that do not function as designed.

i. Verify operation of charging mechanism. Investigate units that do not function as designed.

3. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

E. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports.

1. Test procedures used.
2. Include identification of each enclosed switch and circuit breaker tested and describe test results.
3. List deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION 262816

SECTION 265619 - EXTERIOR LIGHTING

PART 28 - GENERAL

28.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

28.2 SUMMARY

A. Section Includes:

1. Exterior solid-state luminaires that are designed for and exclusively use LED lamp technology.
2. Luminaire supports.
3. Luminaire-mounted photoelectric relays.

B. Related Requirements:

1. Section 260923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.

2. Section 260926 "Lighting Control Panelboards" for panelboard-based lighting control.

28.3 REFERENCES:

A. NFPA 70, "National Electrical Code", (NEC)

B. Illuminating Engineering Society of North America (IESNA):

1. IES Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products, LM-79.

2. IES Approved Method for Measuring Lumen Maintenance of LED Light Sources, LM-80.

3. IES Approved Method for Characterization of LED Light Engines and LED Lamps for Electrical and Photometric Properties as a Function of Temperature, LM-82.

4. IES Projecting Long Term Lumen Maintenance of LED Products, TM-21-11

C. American National Standards Institute (ANSI):

1. ANSI C78.377-2015, Specifications for the Chromaticity of Solid State Lighting Products.

D. Underwriter's Laboratories (U.L.) Standards.

E. Codes: Materials and installations shall be in accordance with the latest revision of the National Electrical Code and any applicable Federal, State and local codes and regulations.

F. Listing: All luminaires shall be manufactured in strict accordance with the appropriate and current requirements of the National Electrical Code as verified by Underwriters' Laboratories, Inc. (U.L.), or tested to UL standards by other nationally recognized testing agency as acceptable to Building Officials and Code Administrators International (BOCAI); the International Conference of Building Officials (ICBO); or other relevant code authority recognized by the jurisdiction within which the project is being constructed. Such a listing shall be provided for

each luminaire type, and the appropriate label or labels shall be affixed to each luminaire in a location as required by code or law.

28.4 DEFINITIONS

A. CCT: Correlated color temperature.
B. CRI: Color rendering index.
C. Fixture: See "Luminaire."
D. IP: International Protection or Ingress Protection Rating.
E. LED: Light-emitting diode
F. Lumen: Measured output of lamp and luminaire, or both.
G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.
H. LED Light Engine: a combination of an LED module and the associated control gear (driver).

28.5 ACTION SUBMITTALS

A. Product Data: For each type of luminaire.
   1. Arrange in order of luminaire designation.
   2. Physical description of luminaire, including materials, dimensions, effective projected area, and verification of indicated parameters.
   3. Details of attaching luminaires and accessories.
   4. Details of installation and construction.
   5. Lamps and/or LED modules, including life, output, CCT, CRI, lumens, and energy-efficiency data.
   6. Photometric data and adjustment factors based on laboratory tests, complying with IES Lighting Measurements Testing and Calculation Guides, of each luminaire type. The adjustment factors shall be for lamps and accessories identical to those indicated for the luminaire as applied in this Project

      a. Manufacturer's Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the NVLAP for Energy Efficient Lighting Products.

      b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.

   7. Wiring diagrams for power, control, and signal wiring.
   8. Photoelectric relays.
   9. Ballasts and/or drivers, including energy-efficiency data.
   10. Means of attaching luminaires to supports and indication that the attachment is suitable for components involved.

B. Shop Drawings: For nonstandard or custom luminaires.
   1. Include plans, elevations, sections, and mounting and attachment details.
   2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   3. Include diagrams for power, signal, and control wiring.

C. Samples: For products designated for sample submission in the Exterior Lighting Device Schedule. Each Sample shall include the following:

   1. Lamps and ballasts, installed.
   2. Cords and plugs.
   3. Specified support system.

D. Installation Instructions
E. Product Schedule: For luminaires and lamps as indicated in Lighting Fixture Schedule
F. Field quality-control reports.
G. Delegated-Design Submittal: For luminaire supports.
   1. Include design calculations for luminaire supports and seismic restraints.

28.6 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Luminaires.
2. Structural members to which equipment and luminaires will be attached.
3. Above-grade utilities and structures.
4. Bridge features.
5. Vertical and horizontal information.

B. Qualification Data: For testing laboratory providing photometric data for luminaires.

C. Seismic Qualification Certificates: For luminaires, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Product Certificates: For each type of the following:

1. Luminaire.
2. Photoelectric relay.

E. Product Test Reports: For each luminaire, for tests performed by manufacturer and witnessed by a qualified testing agency or a qualified testing agency.

F. Source quality-control reports.

G. Sample warranty.

28.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and photoelectric relays to include in operation and maintenance manuals.
1. Provide a list of all lamp types used on Project. Use ANSI and manufacturers' codes.
2. Provide a list of all photoelectric relay types used on Project; use manufacturers' codes.

28.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Luminaires: One for every 10 of each type installed. Furnish at least one of each type and length.
2. Diffusers and Lenses: One for every 10 of each type installed. Furnish at least one of each type.
3. Integral Power Supplies: One for every 10 of each type installed. Furnish at least one of each type.

Extra materials shall be delivered to DelDOT at the following address:
ATTN: Mr. Anthony Riccio
Delaware Department of Transportation
North District Building
39 East Regal Boulevard

28.9 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturers' laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products and complying with applicable IES testing standards.

C. Provide luminaires from a single manufacturer for each luminaire type.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. Comply with IEEE C2, "National Electrical Safety Code."

F. Comply with NFPA 70.

G. FM Global Compliance: Lighting fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

H. LED Luminaires shall be photometrical tested in accordance with IESNA LM-79 Standard

I. Life and operation of LED modules shall be tested in accordance with IESNA LM-80 Standard

J. White LEDs shall be binned to a minimum chromaticity in accordance with ANSI/NEMA/ANSLG C78.377-2015 Standard

28.10 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering prior to shipping.

28.11 FIELD CONDITIONS

A. Verify existing and proposed utility structures prior to the start of work associated with luminaire installation.
B. Mark locations of exterior luminaires for approval by Architect prior to the start of luminaire installation.

28.12 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures, including luminaire support components.
b. Faulty operation of luminaires and accessories.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
d. Power supply or driver failure
e. LED failure

2. Warranty Period: 5 years from date of Substantial Completion.

PART 29 - PRODUCTS

29.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide products indicated on Drawings.

29.2 LUMINAIRE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. NRTL Compliance: Luminaires shall be listed and labeled for indicated class and division of hazard by an NRTL.

C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

D. UL Compliance: Comply with UL 1598 and listed for wet location.

E. CRI of minimum 80. CCT of 2700 K.

F. Minimum LED performance shall be 70% lumen maintenance at 50,000 hours operation at a forward current up to 700mA with junction temperature maintained at or below 135° C.Internal driver and power supply.

G. LED drivers shall be integral or remote type as specified on the drawings and shall provide continuous current matched to LED array requirements. Driver shall be High Power Factor (HPF) with <20% total harmonic distortion (THD) full load, Driver performance shall comply with the requirements of the Federal Communications Commission (FCC) rules and regulations, Title 47 CFR Part 15.

H. LED luminaire shall be constructed and heat-sinked to maintain LED performance as reported by LED manufacturer and exhibited in IESNA LM-79 and LM-80 test reports.

I. Nominal Operating Voltage: 120 V ac.
J. Source Limitations: Obtain luminaires from single source from a single manufacturer.
K. Source Limitations: For luminaires, obtain each color, grade, finish, type, and variety of luminaire from single source with resources to provide products of consistent quality in appearance and physical properties.

29.3 MATERIALS

A. Metal Parts: Free of burrs and sharp corners and edges.
B. Sheet Metal Components: Corrosion-resistant aluminum. Form and support to prevent warping and sagging.
C. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses.
D. Exposed Hardware Material: Stainless Steel
E. Diffusers and Globes:
   1. Acrylic Diffusers: 100 percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
   2. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.
F. Lens and Refractor Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.
G. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:
   1. White Surfaces: 85 percent.
   2. Specular Surfaces: 83 percent.
   3. Diffusing Specular Surfaces: 75 percent.
H. Housings:
   1. Rigidly formed, weather- and light-tight enclosure that will not warp, sag, or deform in use.
   2. Provide filter/breather for enclosed luminaires.
I. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp characteristics:
   a. "USE ONLY" and include specific lamp type.
   b. Lamp diameter, shape, size, wattage and coating.
   c. CCT and CRI for all luminaires.

29.4 FINISHES

A. Variations in Finishes: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
B. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.
C. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
   1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
   2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20 requirements; and seal aluminum surfaces with clear, hard-coat wax.
   3. Class I, Clear-Anodic Finish: AA-M32C22A41 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
   4. Class I, Color-Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker), complying with AAMA 611.
      a. Color: As indicated in Lighting Fixture Schedule
D. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
   1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1 or SSPC-SP 8.
   2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.
      a. Color: As selected from manufacturer's standard catalog of colors.

29.5 LUMINAIRE SUPPORT COMPONENTS

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

PART 30 - EXECUTION

30.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
B. Examine roughing-in for luminaire electrical conduit to verify actual locations of conduit connections before luminaire installation.
C. Examine bridge structure and handrail for suitable conditions where luminaires will be installed.
D. Proceed with installation only after unsatisfactory conditions have been corrected.

30.2 TEMPORARY LIGHTING

A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is substantially complete, clean luminaires used for temporary lighting and install new lamps.

30.3 GENERAL INSTALLATION REQUIREMENTS

A. Comply with NECA 1.

B. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.
C. Install lamps in each luminaire.
D. Fasten luminaire to structural support.
E. Supports:
   1. Sized and rated for luminaire weight.
   2. Able to maintain luminaire position after cleaning and relamping.
   3. Support luminaires without causing deflection of finished surface.
   4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.
F. Wiring Method: Install cables in raceways. Conceal raceways and cables.
G. Coordinate layout and installation of luminaires with other construction.
H. Adjust luminaires that require field adjustment or aiming.
I. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" and 260533 "Raceways and Boxes for Electrical Systems" for wiring connections and wiring methods.

30.4 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.
B. Steel Conduits: Comply with Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- (0.254-mm-) thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

30.5 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

30.6 FIELD QUALITY CONTROL

A. Inspect each installed luminaire for damage. Replace damaged luminaires and components.
B. Perform the following tests and inspections
   1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
C. Illumination Tests:
   1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IES testing guide(s):
      a. IESNA LM-72, "Directional Positioning of Photometric Data."
   2. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
D. Luminaire will be considered defective if it does not pass tests and inspections.
E. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

30.7 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain luminaires

30.8 STARTUP SERVICE

A. Burn-in all luminaires all LED lamps/luminaires for at least 100 hours at full voltage prior to occupancy by Owner.

END OF SECTION 265619

Method of Measurement:

The quantity of Bridge Lighting and Power will not be measured.

Basis of Payment:

The quantity of Bridge Lighting and Power will be paid for at the Contract lump sum price for item 746559. Price and payment will constitute full compensation for furnishing all materials related to the lighting and electrical equipment, and for all labor, tools, and equipment and necessary incidentals to complete the work.

The breakout sheet attached to the proposal shows all bridge lighting and electrical items proposed for this Contract. The Contractor shall fill in the per each unit price and the cost (unit price times the proposed quantity) for each item listed. The lump sum price bid for item 746559 - Bridge Lighting and Power shall be the sum of the total cost for all items listed. The completed typewritten 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 the furnishing and installing of one or more items listed and the right to add or subtract from the quantity of each item listed. 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 to the Contractor if such additions and/or deletions are made.

Payment for the Bridge Lighting and Power as described above may be processed if, in the opinion of the Engineer, all work required is satisfactorily completed. No partial payment will be made for any item until and unless installed in accordance with these specifications.

12/7/15

746590 - FURNISH & INSTALL GROUND ROD

Description:

This item consists of furnishing and installing ground rods at locations shown on the plans or as directed by the Engineer. The item will be used only when an individual ground rod is to be replaced or added as a singular item. Costs for Ground Rods installed as part of other items (Pole Bases, Junction Wells, Metered Service Pedestals, etc.) will not be paid separately, but will be included in those respective pay items.

Material:

Each Ground Rod shall be copper clad, approved by the Underwriter's Laboratory and be supplied with approved clamps for connecting the grounding conductor to the rod. The Ground Rod shall be ¾" Diameter and shall have a minimum length of 10', unless detailed otherwise in the contract documents.

Construction Methods:

When installing the Ground Rod, a length of at least 8 feet shall be embedded into undisturbed soil. Measure the ground resistance of each rod before connecting the rod to the grounding conductor. If the measured resistance exceeds 25 ohms, exothermically weld a 10 ft. extension to the top of the first rod and drive to its full depth. Measure the earth resistance again. If it still exceeds 25 ohms, contact the engineer for instruction.

Where rock is encountered and an acceptable earth ground cannot be accomplished by driving as described above, the Engineer may direct the use of a grounding grid. Direct buried rods are exothermically welded end to end to bond lighting standards and structures in continuous series to some point where an acceptable ground can be obtained.

Maintain continuity of the equipment grounding system throughout the project.
Connection to equipment grounding systems shall be made with suitable lugs at all grounding bushings specified, and at the ground lugs in lighting or traffic signal structure access holes or in a breakaway base. Make connections to ground rods as specified in the contract documents. Connections to neutral grounding systems shall be made with grounding lugs.

Measurement and Payment:

Ground Rods will be paid on a per each 10 ft. length. Price and payment includes furnishing, installing, labor, grounding lugs, welding, excavation, backfill, and connecting the ground rod as shown on the plans, standard details, or as directed by the Engineer.

2/29/12

746596 - JUNCTION BOX ON STRUCTURE

Description:

The item shall consist of furnishing and installing Junction Box(es) as detailed on the Plans and specified herein.

Materials and Construction Methods:

Unless noted otherwise on the Plans, the junction box shall be 12" x 12" x 6", cast iron and hot-dipped galvanized. Units shall be surface-mounted to structure and held in place by four stainless steel drop-in anchors and bolts. A flat neoprene gasket shall be cemented to cover. The unit shall be U.L. listed and NEMA 4.

Method of Measurement:

The number of junction boxes to be measured under this item shall be the actual number of installed junction boxes in accordance with these specifications.

Basis of Payment:

The number of junction boxes, as determined above, shall be paid for at the contract unit price bid per Each for Item 746596, Junction Boxes on Structure, which price and payment shall constitute full compensation for furnishing and installing of the box, and other related hardware, for all labor, tools, equipment and necessary incidentals to complete the work.

9/15/15

747500 - LOAD CENTER CABINETS WITH PAD

Description:

This work consists of providing and installing load center cabinets with pad with all necessary conduits, underground facilities, equipment, and wiring as indicated on the Plans or as directed by the Engineer.

Materials:

The concrete for the pad shall conform to Section 812, Class B of the Standard Specifications.

Galvanized steel conduits and fittings shall be as specified under Section 745 of the Standard Specifications.

The cabinets and doors shall be constructed from 5052-H32 sheet aluminum alloy with a thickness of 0.125" (3.2 mm). External welds shall be made by using heliarc welding method, internal weld, may be made by the wire welding method. All welds shall be neatly formed and free of cracks, flow holes and otherwise irregularities.

The outside surface of the cabinet shall have a smooth uniform, natural aluminum finish. The cabinets shall have a sloped top to prevent the accumulation of water on its top surface. The cabinet shall have a solid aluminum bottom panel. The cabinet shall have vented louvers on the front door.

The enclosure door frame shall be double flanged out on all four sides. These flanges increase strength of opening and keep dust and liquids from dropping into enclosure when door is opened. The cabinet door shall be hinged on the right side when facing the cabinet and shall be a minimum 80% of the front surface area. The door shall be gasketed to satisfy requirements of NEMA 4X enclosure.

The door shall have a heavy gauge continuous hinge with 1/4" (6 mm) diameter stainless steel hinge pin. Hinge shall be secured with 1/4-20 stainless steel carriage bolts and stainless steel nylock nuts.

Cabinets shall be provided with a 5052-H32 aluminum alloy metal back panel of 0.125" (3.2 mm) minimum thickness. All mounting hardware shall be furnished. All internal hardware shall be either stainless steel or cadmium pressed steel Type II, Class I.

Cabinets finish shall be natural aluminum mill finish for Fed. Spec. QQA-250/8.

Panelboards for 240/480 volt installations shall be single phase three-wire and shall have main-rated busses and shall conform to Federal Specification W-P-115B, Type 1, Class 1. Circuit breakers shall be UL listed and comply with NEMA Standards and Federal Specification W-C-375B.

The size and rating of other electrical apparatus within the two (2) cabinets that comprise the load center cabinets shall be as designated on the Plan details.

Construction Methods:

The concrete pad shall be a cast-in-place monolithic slab, with sides formed to a minimum 30" (0.75 m) depth below the final ground surface. Concrete shall not be poured until the forming, position of conduits and grounding facilities are approved by the Engineer. Appropriate provisions shall be used to support conduit, grounding facilities and anchor bolts during concrete pouring and curing. All conduits shall be provided with temporary pipe caps during the placement of concrete. A minimum distance of 1" (25 mm) shall be maintained between conduits.

Forms shall not be removed from the concrete pad until twenty-four (24) hours after the concrete has been poured and the pad is to be kept moist for a period of seven (7) days after pouring. The concrete surface shall be level and have a broom finish.

All excavation material shall be stockpiled on the site until backfilling has been completed. Backfill may be placed after the first 24 hours and is to be accomplished in 6" (150 mm) layers, with each lift mechanically tamped. All excess material is to be removed and used elsewhere on the project as approved by the Engineer.

Cabinets shall be installed on the concrete pad using the method of attachment as noted on the Plan details.

Method of Measurement:

The quantity of load center cabinets with pads be measured as the actual number of load center cabinets with pads, each consisting of the two cabinets with pad and all equipment and wiring within, complete in place and accepted.

The pad will include all conduits within the pad, grounding bushings on conduits coming out of top of pad, and anchor bolts as shown on the contract drawings.

Basis of Payment:

The quantity of load center cabinets with pads will be paid for at the Contract unit price per each. Price and payment will constitute full compensation for furnishing all materials, excavation and backfilling for the pad, and for all labor, equipment, tools and incidentals necessary to complete the item.

12/7/15

759511 - FIELD OFFICE, SPECIAL II

Description:

This Field Office, Special item shall consist of erecting, furnishing, equipping, maintaining, and removing a double wide modular field office, its entrances, and its adjacent parking area. The Contractor shall submit a specific location layout drawing and construction details for the proposed field office, its entrances, and its parking area for approval by the Engineer. The field office and its parking area shall be for the exclusive use of Department Officials, Engineers, Consultants, Inspectors, and any other parties involved with the construction and/or administration of the project.

The field office structure shall be free of asbestos and/or other hazardous materials. The 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 the field office, its entrances, and its parking area. The costs of obtaining such licenses and permits are to be incidental to the Field Office, Item. The field office shall be available for use by the Department continuously throughout the duration of the project.

Construction and Equipment:

The 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" width. The floor to ceiling height of the field office shall be nominal 8'-0". The exterior walls, ceiling, and floor of the field office shall be insulated. The 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 in-ground 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 the 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 the field office of at least 2,500 square feet and having a minimum of 10 functional parking spaces striped for full size cars. All weather pathways from the parking area to the entrance of the field office shall also be constructed and maintained. This parking area and entrance pathway 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, is incidental to the "Field Office, Special" Item.

The ground area 30'-0" from around the perimeter of the 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, suitably maintained and 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.

The field office shall have full carpeting, kitchenette facilities, and interior and exterior paneling, lighting, and plumbing fixtures. The 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 representative. The exterior doors shall be insulated or have storm doors. The 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 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 one (1) outside water service connection shall be provided at the field office. The 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.

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

The field office shall have satisfactory lighting, electrical outlets, heating equipment, 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 bulbs shall be furnished as required. Electrical current, water service, telephone service, internet service, 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 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. 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.

The Contractor shall provide an alarm system for field office security with electronic, direct connection to a security service provider. The security system shall have interior motion, window, and entrance detectors and built in manual fire alarm. 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. The service 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 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. 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.

The Contractor shall be responsible to provide and maintain all necessary telephone and internet connections, 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 4 lines consisting of 3 direct single lines with call forward busy feature and 1 dedicated facsimile line. All lines shall be capable of making unlimited local and long distance calls. The telephone system shall have 3 phone sets with privacy feature (1 set which may be for wall mounting). The dedicated facsimile line shall be capable of sending facsimiles to either local or long distance numbers. The telephone system is for the official and exclusive use of the Engineer and other representatives of the Department. Location of telephone lines shall by 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 will all subsequent monthly billings for the field office telephone system.

The field office internet system shall be a broadband connection capable of download speeds of at least 50 Megabits per second and upload speeds of at least 10 Megabits per second. The internet connection

shall be capable of attaching to a wireless networking hub/router, which is also to be provided by the Contractor to allow for connection of multiple PCs as outlined further in this Specification. Cost of installation, setup, and all subsequent monthly billings shall be the responsibility of the Contractor.

For all 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 interior 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. Placement of these furnishings shall be as directed by the Engineer. These furnishings consist of 1 drafting table with sufficient drawers for standard size plans, either attached to the tables or in cabinet form, with an ergonomic design spring back stool with five leg base having wheel casters, 6 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, 2 legal size filing cabinets with 4 drawers, 4 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:

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

1 professional or office grade laser printer, color, to have the ability to print on paper size of up to 11" by 17" in size, with two-sided printing capabilities, having wireless and hard line network connectivity, with 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.

1 Canon imageRUNNER C3080i, XEROX Work Centre 7845, or approved equal all-in-one copier which includes color scanner, color 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 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 or voice mail 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;

3 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 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 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, 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 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:

The field office shall have five (5) 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. Each of the five (5) Microcomputer Systems shall consist of, at a minimum:

Central Processing Unit (CPU) – Lap Top

Intel I5, 4th Generation, processor,

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

Memory & Connectivity

8x DVD +/- RW with double layer write capability, and 250GB hard drive minimum, integrated Ethernet 10/100, a 802.11n or better wireless card. 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, integrated video or better;

Keyboard

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

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". The required applications software follows and is to be latest version unless noted:

collection - "Office Home & Business 2013" 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, 802.11n 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,

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 shutdown of the computer system with software and connections for automatic system shutdown,

Two channel Sound Blaster compatible or better PCI soundcard with 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.

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 the field office including its entrances 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 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. Full months will be paid at the rate of 1.000 Each-Month, regardless of the number of days in the month.

Basis of Payment:

The field office 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 the field office, its entrance, and its adjacent parking area and restore the field office area, entrance, and adjacent parking area to match the original site condition. Price shall also include 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. No separate payment will be made for costs involved with removing hazardous material or underground tanks to install the field office, its entrances, and its parking area. No separate payment will be made for reimbursement of phone/internet or any other utility.

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

The field office, its entrance, and its parking area shall be ready for use not later than thirty (30) calendar days after the date of the fully executed Contract and before construction operations begin.

9/18/2014

763501 - CONSTRUCTION ENGINEERING

1) **Description:**

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

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

The Engineer will only establish the following:

(a) Original and final cross-sections for borrow pits.
(b) Final cross-sections: Top and bottom pay limit elevations for all excavation bid items that are not field measured by Construction inspection personnel. The Contractor shall notify the Engineer when these pay limit elevations are ready and allow for a minimum of two calendar days for the Engineer to obtain the information.
(c) Line and grade for extra work added on to the project plans.

2) Equipment. The Contractor shall use adequate equipment/instruments in a good working order. He/she shall provide written certification that the equipment/instrument has been calibrated and is within manufacturer's tolerance. The certification shall be dated a maximum of 9 months before the start of construction. The Contractor shall renew the certification a minimum of every 9 months. The equipment/instrument shall have a minimum measuring accuracy of [3mm+2ppmxD] and an angle accuracy of up to 2.0 arc seconds or 0.6 milligons. If the Contractor chooses to use GPS technology in construction stakeout, the Contractor shall provide the Engineer with a GPS rover and Automatic Level for the duration of the contract. The GPS rover shall be in good working condition and of similar make and model used by the Contractor. The Contractor shall provide up to 8 hours of formal training on the Contractor's GPS system to a maximum of four Engineer's appointees (DELDOT Construction Inspectors). At the end of the contract, the Engineer will return the GPS rover to the Contractor. If any of the equipment/instruments are found to be out of adjustment or inadequate to perform its function, such instrument or equipment shall be immediately replaced by the Contractor to the satisfaction of the Engineer. Choosing to use GPS technology does not give the contractor authority to use machine control.- Construction Engineering (GPS) Machine Control Grading shall only be used if noted in the General Notes in the plan set outlining the available files that will be provided to the Contractor and "the Release for delivery of documents in electronic form to a contractor" are signed by all parties prior to delivery of any electronic files. Only files designated in the General Notes shall be provided to the contractor. If machine control grading is allowed on the project see the "machine control" section of this specification. GPS technology and machine control technology shall not be used in the construction of bridges.

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

Construction Methods:

4) Performance Requirements:

(a) Construction Engineering shall include establishing the survey points and survey centerlines; finding, referencing, offsetting the project control points; running a horizontal and vertical circuit to verify the precision of given control points. Establishing plan coordinates and elevation marks for culverts, slopes, subbase, subsurface drains, paving, subgrade, retaining walls, and any other stakes required for control lines and grades; and setting vertical control elevations, such as footings, caps, bridge seats and deck screed. The Contractor shall be responsible for the preservation of the Department's project control points and benchmarks. The Contractor shall establish and preserve any temporary control points (traverse points or benchmarks) needed for construction. Any project control points (traverse points) or benchmarks conflicting with construction of the project shall be relocated by the Contractor. The Contractor as directed by the Engineer must replace any or all stakes that are destroyed at any time during the life of the contract. The Contractor shall re-establish centerline points and stationing prior to final cross-sections by the Engineer. The Vertical Control error of closure shall not exceed 0.035 ft times [Square root of number of miles in the level run] (0.01 m times [square root of number of kilometers]). The Horizontal Control precision ratio shall have a minimum precision of 1:20,000 feet (1 meter per 20,000 meters or 1:20,000) of distance traversed prior to adjustment.

(b) The Contractor shall perform construction centerline layout of all roadways, ramps and connections, etc. from project control points set by the Engineer. The Contractor using the profiles and typical sections provided in the plans shall calculate proposed grades at the edge of pavement or verify information shown on Grades and Geometric sheets.

(c) The Contractor shall advise the Engineer of any horizontal or vertical alignment revisions needed to establish smooth transitions to existing facilities. The Contractor must immediately bring to the attention of the Engineer any potential drainage problem within the project limits. The Engineer must approve any proposed variation in profile, width or cross slope.

(d) The Contractor shall establish the working points, centerlines of bearings on bridge abutments and on piers, mark the location of anchor bolts to be installed, check the elevation of bearing surfaces before and after they are ground and set anchor bolts at their exact elevation and alignment as per Contract Plans. Before completion of the fabrication of beams for bridge superstructures, the Contractor shall verify by accurate field measurements the locations both vertically and horizontally of all bearings and shall assume full responsibility for fabricated beams fitting and bearing as constructed. After beam erection and concurrently with the Department project surveyors or their designated representative, the Contractor shall survey top of beam elevations at a maximum of 10-ft (3.0-meter) stations and compute screed grades. These shall be submitted to the Engineer for review and approval before the stay in place forms are set. Construction stakes and other reference control marks shall be set at sufficiently frequent intervals to assure that all components of the structure are constructed in accordance with the lines and grades shown on the plans. The Contractor will be responsible for all structure alignment control, grade control and all necessary calculations to establish and set these controls.

(e) The Contractor, using contract plans, shall investigate proposed construction for possible conflicts with existing and proposed utilities. The Contractor shall then report such conflicts to the Engineer for resolution. All stakes for utility relocations, which will be performed by others, after the Notice to Proceed has been given to the Contractor, shall be paid for under item 763597 - Utility Construction Engineering.

(f) The Contractor shall be responsible for the staking of all sidewalk and curb ramp grades in accordance with the plans and the Departments Standard Construction Details. The Contractor shall review the stakeout with the Engineer prior to construction. The Engineer must approve any deviation from plans, Department Standard Construction Details and Specifications in writing. The Contractor shall be responsible for any corrective actions resulting from problems created by adjustments if they fail to obtain such approval.

(g) If wetland areas are involved and specifically defined on the Plans the following shall apply:

i. It is the intent of these provisions to alert the Contractor, that he/she shall not damage or destroy wetland areas, which exist beyond the construction limits. These provisions will be strictly enforced and the Contractor shall advise his/her personnel and those of any Subcontractor of the importance of these provisions.

ii. All clearing operations and delineation of wetlands areas shall be performed in accordance with these Special Provisions. Before any clearing operation commences the Contractor shall demarcate wetlands at the Limits of Construction throughout the entire project as shown on the Plans labeled as Limits of Construction or Wetland Delineation to the satisfaction of the Engineer.

iii. The material to be used for flagging the limits of construction shall be orange vinyl material with the wording "Wetland Boundary" printed thereon. In wooded areas, the flagging shall be tied on the trees, at approximate 20-foot (6.1 meter) intervals through wetland areas. In open field and yard areas that have been identified as wetlands, 3 foot (one meter) wooden grade stakes shall be driven into the ground at approximate 20 foot (6.1 meter) intervals and tied with the flagging.

iv. If the flagging has been destroyed and the Engineer determines that its use is still required, the Contractor shall reflag the area at no cost to the Department. If the Contractor, after notification by the Engineer that replacement flagging is needed, does not replace the destroyed flagging within 48 hours, the Engineer may proceed to have the area reflagged. The cost of the reflagging by the Engineer will be charged to the Contractor and deducted from any monies due under the Contract.

v. At the completion of construction, the Contractor shall remove all stakes and flagging.

vi. The Contractor shall be responsible for any damages to wetlands located beyond the construction limits, which occurs from his/her operations during the life of the Contract. The Contractor shall restore all temporarily disturbed wetland areas to their preconstruction conditions. This includes restoring bank elevations, streambed and wetland surface contours and wetlands vegetation disturbed or destroyed. The expense for this restoration shall be borne solely by the Contractor.

(h) Whenever the Engineer will be recording data for establishment of pay limits, the Contractor will be invited to obtain the data jointly with the Engineer's Survey Crew(s) in order to agree with the information. If the Contractor's representative is not able to obtain the same data, then the information obtained by the Engineer shall be considered the information to be used in computing the quantities in question.

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

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

(a) Proposed method of recording information in field books to ensure clarity and adequacy.
(b) A printout of horizontal control verification, as well as coordinates, differences and error of closure for all reestablished or temporary Control Points.
(c) A printout of vertical control verification, with benchmark location elevation and differences from plan elevation.
(d) Sketch of location of newly referenced horizontal control, with text printout of coordinates, method of reference and field notes associated with referencing control - traverse closure report.
(e) Description of newly established benchmarks with location, elevation and closed loop survey field notes - bench closure report
(f) All updated electronic and manuscript survey records.
(g) Stakeout plan for each structure and culvert.
(h) Computations for buildups over beams, screed grades and overhang form elevations.
(i) A report showing differences between supplied baseline coordinates and field obtained coordinates, including a list of preliminary input data.
(j) Any proposed plan alteration to rectify a construction stakeout error, including design calculations, narrative and sealed drawings.
(k) Baseline for each borrows pit location.

(l) Detailed sketch of proposed overhead ground mounted signs or signals showing obstructions that may interfere with their installation.
(m) Copies of cut sheets.

Machine Control Grading

This Section of the specification shall only be used if machine control is authorized for use on the project.

Description:

This specification contains the requirements for grading operations utilizing Global Positioning Systems (GPS).

Use of this procedure and equipment is intended for grading the subgrade surface; it is not intended for the use in constructing final surface grades.

The Contractor may use any manufacturer's GPS machine control equipment and system that results in achieving the grading requirements outlined in section 202 of the standard specifications. The Contractor shall convert the electronic data provided by the Department into the format required by their system. The Department will only provide the information outlined in this document and no additional electronic data will be provided.

The Contractor shall perform at least one 500 foot test section with the selected GPS system to demonstrate that the Contractor has the capabilities, knowledge, equipment, and experience to properly operate the system and meet acceptable tolerances. The engineer will evaluate and make the determination as to whether additional 500 foot test sections are required. If the Contractor fails to demonstrate this ability to the satisfaction of the Department, the Contractor shall construct the project using conventional surveying and staking methods.

Materials:

All equipment required to perform GPS machine control grading, including equipment needed by DelDOT to verify the work, shall be provided by the Contractor and shall be able to generate end results that are in accordance with the requirements of Division 200 - EARTHWORK of the Standard Specifications.

Construction:

a. DelDOT Responsibilities:

1. The Department will set initial vertical and horizontal control points in the field for the project as indicated in the contract documents, (plans set). If the Contractor needs to establish new control points they shall be traversed from existing control points and verified to be accurate by conventional surveying techniques.

2. The Department will provide the project specific localized coordinate system.

3. The Department will provide data in an electronic format to the Contractor as indicated in the General Notes.

    a. The information provided shall not be considered a representation of actual conditions to be encountered during construction. Furnishing this information does not relieve the Contractor from the responsibility of making an investigation of conditions to be encountered including, but not limited to site visits, and basing the bid on information obtained from these investigations, and the professional interpretations and judgments of the Contractor. The Contractor shall assume the risk of error if the information is used for any purpose for which the information is not intended.

b. Any assumption the Contractor makes from this electronic information shall be at their risk. If the Contractor chooses to develop their own digital terrain model the Contractor shall be fully responsible for all cost, liability, accuracy and delays.

c. The Department will develop and provide electronic data to the Contractor for their use as part of the contract documents in a format as indicated in the General Notes. The Contractor shall independently ensure that the electronic data will function in their machine control grading system.

4. The Files that are provided were originally created with the computer software applications MicroStation (CADD software) and INROADS (civil engineering software). The data files will be provided in the native formats and other software formats described below. The contractor shall perform necessary conversion of the files for their selected grade control equipment. The Department will furnish the Contractor with the following electronic files:

   a. CAD files
      i. Inroads -Existing digital terrain model (.DTM)
      ii. Inroads -Proposed digital terrain model (.DTM)
      iii.Microstation -Proposed surface elements - triangles

   b. Alignment Data Files:
      i. ASCII Format

5. The Engineer shall perform spot checks of the Contractor's machine control grading results, surveying calculations, records, field procedures, and actual staking. If the Engineer determines that the work is not being performed in a manner that will assure accurate results, the Engineer may order the Contractor to redo such work to the requirements of the contract documents, and in addition, may require the Contractor to use conventional surveying and staking, both at no additional cost to the Department.

B. Contractor's Responsibilities

1. The Contractor shall provide the Engineer with a GPS rover and Automatic Level, for use during the duration of the contract. At the end of the contract, the GPS rover and Automatic Level will be returned to the Contractor. The Contractor shall provide a total of 8 hours of formal training on the Contractor's GPS machine control system to the Engineer and up to three additional Department appointees per rover.

2. The Contractor shall review and apply the data provided by the Department to perform GPS machine control grading.

3. The Contractor shall bear all costs, including but not limited to the cost of actual reconstruction of work, that may be incurred due to application of GPS machine control grading techniques. Grade elevation errors and associated corrections including quantity adjustments resulting from the contractor's use of GPS machine control shall be at no cost to the Department.

4. The Contractor shall convert the electronic data provided by the Department into a format compatible with their system.

5. The Contractor's manipulation of the electronic data provided by the Department shall be performed at their own risk.

6. The Contractor shall check and if necessary, recalibrate their GPS machine control system at the beginning of each workday in accordance with the manufacturer's recommendations, or more frequently as needed to meet the requirements of the project.

7. The Contractor shall meet the accuracy requirements as detailed in the Standard Specifications.

8. The Contractor shall establish secondary control points at appropriate intervals and at locations along the length of the project. These points shall be outside the project limits and/or where work is performed. These points shall be at intervals not to exceed 1000 feet. The horizontal position of these

points shall be determined by conventional survey traverse and adjustments from the original baseline control points. The conventional traverse shall meet or exceed the Department's Standards. The elevation of these control points shall be established using differential leveling from the project benchmarks, forming a closed loop. A copy of all new control point information including closure report shall be provided and approved by the Engineer prior to construction activities. The Contractor shall be responsible for all errors resulting from their efforts and shall correct deficiencies to the satisfaction of the Engineer and at no additional cost to the Department.

9. The Contractor shall provide stakes at all alignment control points, at every 500 foot stationing, and where required for coordination activities involving environmental agencies and utility companies at the Contractor's expense. Work that is done solely for utility companies and that is beyond the work performed under item 763501 - Construction shall follow and be paid for under item 763597 -Utility Construction Engineering.

10. The Contractor shall at a minimum set hubs at the top of finished grade at all hinge points on the cross section at 500 foot intervals on the main line and at least 4 cross sections on side roads and ramps as directed by the engineer or as shown on the plans. Placement of a minimum of 4 control points outside the limits of disturbance for the excavation of borrow pits, Stormwater Management Ponds, wetland mitigation sites etc. These control points shall be established using conventional survey methods for use by the Engineer to check the accuracy of the construction.

11. The Contractor shall preserve all reference points and monuments that are identified and established by the Engineer for the project. If the Contractor fails to preserve these items the Contractor shall reestablish them at no additional cost to the Department.

12. The Contractor shall provide control points and conventional grades stakes at critical points such as, but not limited to, PC's, PT's, superelevation points, and other critical points required for the construction of drainage and roadway structures.

13. No less than 2 weeks before the scheduled preconstruction meeting, the Contractor shall submit to the Engineer for review a written machine control grading work plan which shall include the equipment type, control software manufacturer and version, and proposed location of the local GPS base station used for broadcasting differential correction data to rover units.

14. The Contractor shall follow the guidelines set forth in the "Geometric Geodetic Accuracy Standards and Specifications for Using GPS Relative Positioning Techniques" and follow a minimum of Second Order Class 1, (2-I) classification standards.

Automated equipment operations have a high reliance on accurate control networks from which to take measurements, establish positions, and verify locations and features. Therefore, a strong contract control network in the field which is the same or is strongly integrated with the project control used during the design of the contract is essential to the successful use of this technology with the proposed Digital Terrain Model (DTM). Consistent and well designed site calibration for all machine control operations (as described below under *Contract Control Plan*) are required to ensure the quality of the contract deliverables. The Contract Control Plan is intended to document which horizontal and vertical control will be held for these operations. Continued incorporation of the Base Station(s) as identified in the Contract Control Plan is essential to maintaining the integrity of positional locations and elevations of features. The Contract Control Plan shall be submitted to the Department for review and approval by the Departments Survey Section 3 weeks prior to the start of any machine control work. The Contractor shall operate and maintain all elements of the Machine Grade Control continuously once the operations begin until otherwise approved by the Engineer.

Contract Control Plan:

The Contractor shall develop and submit a Contract Control Plan for all contracts which use Machine Control Grading. Contract control includes all primary and secondary horizontal and vertical control which will be used for the construction contract. Upon the Contractor's completion of the initial survey reconnaissance and control verification, but prior to beginning primary field operations, the Contractor shall submit a Contract Control Plan document (signed and sealed by the Delaware licensed Land Surveyor or Delaware Professional Engineer who oversees its preparation) for acceptance by the Engineer, which shall include the following:

1. A control network diagram of all existing horizontal and vertical control recovered in the field as contract control.

2. Include a summary of the calculated closures of the existing control network, and which control has been determined to have been disturbed or out of tolerance from its original positioning.

3. An explanation of which horizontal and vertical control points will be held for construction purposes. If necessary include all adjustments which may have been made to achieve required closures.

4. An explanation of what horizontal and vertical control (including base stations) was set to accomplish the required stakeout or automated machine operation. Include how the position of these new control points was determined.

5. Describe the proposed method and technique (technology and quality control) for utilizing the control to establish the existing and/or proposed feature location and to verify the completed feature location and/or measured quantity.

6. A listing of the horizontal and vertical datums to be used and the combined factor to be used to account for ellipsoidal reduction factor and grid scale factor.

7. If the Contractor chooses to use machine control as a method of measuring and controlling excavation, fill, material placement or grading operations as a method of measuring and controlling excavation, fill, material placement or grading operations, the Contractor Control Plan shall include the method by which the automated machine guidance system will initially be site calibrated to both the horizontal and vertical contract control, and shall describe the method and frequency of the calibration to ensure consistent positional results.

8. Issues with equipment including inconsistent satellite reception of signals to operate the GPS machine control system will not result in adjustment to the "Basis of Payment" for any construction items or be justification for granting contract time extension.

Method of Measurement:

The quantity of Construction Engineering will not be measured.

Basis of Payment:

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

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

3/27/15

763508 - PROJECT CONTROL SYSTEM DEVELOPMENT PLAN
763509 - CPM SCHEDULE UPDATES AND/OR REVISED UPDATES

Description:

The Contractor shall plan, schedule and construct the Project by using a Critical Path Method Project Schedule (CPM) meeting the requirements of these specifications. Use the CPM for coordinating and monitoring the Work specified in the Contract Documents including all activities of Subcontractors, vendors, suppliers, utilities, railroads, the Department, and all other parties associated with the construction of the Contract. Include all Work in the CPM; including but not limited to submittals, major procurement, delivery, and construction activities. Include all activities, including bid items, quantified in the Contract Documents. Base the CPM upon the entirety of the Contract Documents. Utilize CPM software that generates files compatible with Primavera P6 Project Management Release: 7.0.0.

Scheduling Representative:

Designate a scheduling representative prior to submission of the Original Critical Path Method Project Schedule (OCPM). The scheduling representative is the person primarily responsible for development and maintenance of the CPM schedule; the Contractor's representative in all matters regarding the schedule; and the Contractor's designated attendee for all schedule related meetings. The scheduling representative shall also be knowledgeable of the status of all parts of the Work throughout the duration of the Project. Replacement of the scheduling representative will require written approval from the Engineer.

Submit the qualifications of the scheduling representative to the Engineer for approval. This approval is required before the OCPM will be accepted. The scheduling representative shall have at least three years of verifiable experience for preparing and maintaining CPM project schedules on Contracts of similar size and complexity.

Critical Path, Project Completion Date, and Float:

The critical path is defined as the series of activities in a CPM that has the longest path in time. The submitted activity sequence and durations must generate a CPM with only one critical path. Divide Project wide activities such as Maintenance of Traffic, Construction Engineering, or Temporary Erosion Control that, by their nature, generate long durations and complement other activities into "establish" and "conclude" activities to prevent this type of Work from occupying a significant portion of the critical path.

The project start date, or initial data date, of the original CPM shall be the first chargeable day of Work. Nonproductive Work and administrative activities may begin and/or end prior to the project start date. The Original CPM must use all of the Contract Time and contain a critical path containing exactly zero float. Early completion schedules are not permitted. The schedule ending date of the Original CPM that uses all of the Project Time is the contract completion date.

Total Float is the difference between the schedule's finish date and the contract completion date. Free float is the difference in time between an activity's early finish and late finish. Free float is a shared commodity for the use of the Department and the Contractor and is not for the exclusive use or benefit of either party. Both parties have the full use of free float until depleted.

Submittal of the OCPM; the Start of Work and the Schedule of Record:

Complete and submit the proposed original CPM schedule (OCPM) database and the written narrative (WN) within 30 calendar days after Contract is Awarded. The WN is a description of any elements of the Schedule that deviate from the proposed construction sequence shown in the Contract Documents. Submit the OCPM in CPM format fully compatible with Primavera P6 Project Management Release: 7.0.0 by email or CD ROM as a single compressed database in CPM format.

The Engineer will complete the review of the OCPM within 30 calendar days after submittal. If required, a Joint Review Conference will be convened at which time the Engineer and Contractor may make corrections and adjustments to the proposed OCPM. If a revision is necessary due to the Engineer's review

or the Joint Review Conference, submit the proposed revision within seven calendar days after receiving the Engineer's review comments or within seven calendar days after the date of the Joint Review Conference, whichever is the latest. Make revisions in accordance with the requirements for the OCPM. The Engineer will respond to the revised OCPM within seven calendar days after receipt. Clearly identify each submittal and resubmittal for clarity by labeling "2nd Draft", "3rd Draft", etc.

Do not start any Work until the OCPM is accepted. If the Engineer is ready to issue a Notice to Proceed but the OCPM is not yet accepted, the Engineer may issue the NTP and start Contract Time, but forbid Work to begin until the OCPM is accepted. The Engineer may partially accept a OCPM and allow Work to begin if the required corrections to the OCPM are minor, but the Engineer will not accept submittals that do not show the complete schedule. The Engineer will not pay any estimates until the OCPM is partially accepted. Once the OCPM is partially accepted, the Engineer will pay the first estimate. If the Contractor fails to make a good faith effort to address the Engineer's comments before the second estimate is due for payment, the Engineer will not pay the second estimate until a good faith effort is made by the Contractor to comply. The Engineer may not withhold an estimate payment if, within the estimate period in question, the Engineer has failed to provide timely review comments in response to the Contractor's submittal. The Engineer may, however, withhold the payment of subsequent estimates if the Contractor fails to make a good faith effort to address the Engineer's comments. Upon issuance of the Notice to Proceed, the start date utilized in the OCPM will be adjusted to comply with the first chargeable day of Work. Any delay in starting Work caused by the acceptance of the OCPM by the Engineer will not be considered as a basis for any adjustment in the Contract amount or time. For Contracts that have fast-tracked starts, the Engineer and the Contractor may agree to alter the response times and approval dates listed above. Upon notification that the OCPM has been accepted, the corrected copy will become the CPM of record. The CPM of record shall be the Contractor's work plan for completing the entire Contract as specified in the Contract Documents.

Requirements for the OCPM:

The format of the OCPM database shall be the precedence diagram method with days as the planning unit and shall be based on Calendar Days. Use the Department's partially predetermined coding structure (CS) that is furnished by the Engineer.

Activity Sequencing. Activity sequence must be logical and representative of the Contractor's order of the Work. Successors and predecessors determine the schedule logic or activity sequence. A given activity cannot start until all of the given activity's predecessors have been completed. Use only finish to start dependency relationships (links); do not use lag times without approval from the Engineer. The Engineer may request that the Contractor resequence the activities to reflect realistic job logic. When scheduling using multiple resources, each resource unit shall have a corresponding activity. Durations of activities include all the time necessary to complete the activity including, but not limited to, Contractor's non-work periods (other than those shown on the calendars), reasonably foreseeable inclement weather, weekends and holidays. Base schedule calculations on retained logic, contiguous durations, and total float as finish float.

Activity Resources. Sequence activities to reflect resource apportionment. Logically connect and code each activity to reflect the crew (resource) performing the operation. Submit a summary list of crews, their crew codes, and their operation(s) with each schedule submission, unless unchanged. Identify responsibility for each activity. Identify Subcontractors, DBE's, utilities and Work performed by others that affects the Schedule.

Breakdown and Durations of Activities. An individual activity is required for each construction element or each activity not under the control of the Contractor that affects the sequence or progress of the Work. The Engineer reserves the right to require additional breakdown of the Work activities at any time. Each activity must be identified by a name, symbol and coding, and shall have a duration, sequence, responsibility and resource(s). Choose activity names that are descriptive and identify single construction elements. Activity symbols, or ID's, shall be unique and systematic.

Activity types must be either "task", "start milestone", or "finish milestone". Do not use "hammock" type activities. Date constraints, float and duration constraints, and/or flags for activities are not permitted.

Assign a reasonable duration to each activity representative of its scope. Durations may not exceed 14 calendar days unless approved by the Engineer. Determine the duration of each activity by using productivity rates based on Calendar Days.

Include the preparation and approval of Working Drawings as activities. Include phasing (staging) milestones as activities. Correlate phasing milestones with the sequence of construction provided in the Contract Documents. Use a separate start and finish milestone activity to delineate each phase (stage).

*Utility Work***.** Include all Work performed by utilities on the Project as activities in the OCPM. Include each utility item of Work shown in the Contract's Utility Statement as an activity. Durations for utility activities shall be the same as the durations shown in the Utility statement for each activity unless otherwise approved by the Engineer.

*Calendars***.** Assign a calendar to each activity in the schedule. Use a minimum of 6 calendars, when applicable: (1) Full Schedule; (2) Permit Requirements; (3) Winter Condition; (4) Concrete Work; (5) Asphalt Paving Work; and (6) Nighttime Asphalt Paving Work. Use additional calendars if needed. Calendar non-work periods shall reflect the average Delaware weather history for the jobsite and the restrictions identified in the Contract Documents. The Contractor may choose perform Work during an activity's calendar non-work period at no additional cost to the Department if weather conditions are favorable for such Work and the Work does not violate a set forth in the Contract Documents. The maximum allowable non-work period for each calendar is set forth below. The Contractor may choose to shorten non-work periods at his/her discretion.

CALENDAR	MAXIMUM NON-WORK PERIOD
Full Schedule	None
Winter Condition	December 1 through March 15
Concrete Work	December 1 through March 15
Asphalt Paving	November 15 through March 15
Nighttime Asphalt Paving	October 15 through April 30

Written Narrative (WN). Provide a written narrative (WN) as part of the OCPM explaining the following:

(a) Relationships between activities not obviously identified
(b) Equipment usage and limitations.
(c) Manpower usage and limitations.
(d) Use of additional shifts and overtime.
(e) Activity codes, abbreviations, and activity identification system.
(f) All calendars utilized in the CPM and the basis of determining each non-work period
(g) All abbreviations.
(h) Use of calendars.
(i) Any other conditions that affect the schedule and are not readily discernible in the database.

CPM Updates:

Provide monthly updates to the CPM of record. Meet with the Engineer once a month prior to submitting the update to review the status of the schedule's activities. Prepare an updated list of activities showing all of the actual start and actual finish for each of the schedule's activities so that both parties can agree on the dates. Use the dates that were agreed upon in the meeting to status the CPM of record and submit the updated schedule to the Engineer for approval. Assign a unique file name to each update (Number/version). The data date of the update shall be the next day after the end of the update period. As part of the monthly update, submit a written description that identifies any delays or disruptions to the schedule experienced during the period of an update, any change in manpower or equipment, and any potential delays to the completion date of the schedule.

Do not include any revisions to the CPM without prior approval. Failure to submit complete updates in a timely manner may result in the withholding of estimates by the Engineer. The Engineer agrees to refrain from withholding estimates unless the Contractor is habitually late in providing updates, is more than four weeks late in submitting an update or has failed to submit an update that is part of a resolution to a serious problem that must be addressed immediately.

Revisions to the Schedule of Record:

Revisions are defined as any changes to the database other than status updates, log entries and moving the data date. Discuss any proposed revisions to the CPM verbally with the Engineer. If the revision is minor in nature, the Engineer may allow the revision to be included on the next Update of the CPM. If the Engineer determines that the revision is not minor in nature, submit the proposed revision for review and approval prior to deviating from the approved CPM. When a revision to the CPM is required due to changes in the Contract initiated by the Engineer, immediately contact the Engineer to discuss the changes. The Engineer may allow a deviation from the approved CPM for specific mitigating activities.

The Engineer may direct the Contractor to revise the schedule of record at the Contractor's expense if: the critical path has less than minus ten (-10) Calendar Days of total float due to the Contractor's failure to perform the Work in accordance with the schedule; the Contractor requests to re-sequence the Work; and/or the Contractor has performed a significant amount of Work out of sequence. The Engineer may direct the Contractor to revise the schedule for any other reason; and such a revision will be paid at the unit cost for a CPM Revision.

The Engineer will review and respond to the proposed revision within 7 Calendar Days after receipt. Resubmit, if required, within seven calendar days after receipt of the Engineer's review comments. The Engineer reserves the right to reject any proposed revision that adversely impacts the Department, utilities, or other concerned parties.

Extensions of Contract Time and/or Incentive/Disincentive Dates.

Make requests for extension of Contract time in writing and subject to the notice and timeliness of submission provisions as provided for elsewhere in the Contract. Requests for an extension of Contract time or change in an incentive/disincentive date will be evaluated by the Engineer's analysis of the CPM of record and any proposed revision submitted. Include in the request a written narrative of the events that impacted the schedule and a detailed explanation of why the Contractor cannot meet the requirements of the schedule of record. Only delays to activities that affect the Contract completion date or will be considered for an extension of Contract time. Only delays to activities that affect the completion duration of an incentive/disincentive period will be considered for an extension of an incentive/disincentive completion date. The extension of the specified Contract completion date or incentive/disincentive date will be based upon the number of Calendar Days the Contract completion date or incentive/disincentive date is impacted as determined by the Engineer's analysis. The Engineer and Contractor may agree to defer the analysis of a potential impact to the schedule until the completion of the activities that are affected. Such a deferment does not relieve the Contractor of his/her duty to identify potential impacts to the schedule in the applicable schedule updates.

All requests for extensions of Contract Time must be supported by the most recent CPM Update. If, within a reasonable period of time, the Contractor fails to make a good faith effort to produce an acceptable CPM update and uses an unacceptable CPM update to support a request for a time extension, the Contractor loses the right to receive that time extension; and/or the right to receive compensation for that delay caused in whole or in part by the Engineer.

Final As Built Schedule.

Submit a final CPM Schedule database within 14 Calendar Days of Substantial Completion. Failure to submit a final CPM Schedule may result in the withholding of estimates by the Engineer.

Method of Measurement:

The Project Control System will be measured in two items. The item, "Project Control System Development Plan" will be lump sum. The item "CPM Schedule Updates and/or Revised Updates" will be measured one each per update that is submitted and accepted.

Basis of Payment:

The item, "763508 – Project Control System Development Plan" will be paid at the Contract's lump sum bid price on the next monthly estimate after completion of the requirements of the Project Control System Development Plan, which includes the approval of the Original CPM Schedule. Price and payment

will constitute full compensation for preparing the CPM database, acquiring the necessary software, attending all scheduling meetings with the Department, submitting and resubmitting all documents and for all labor, tools, equipment and incidentals necessary to complete the Work.

The item, "763509 – CPM Schedule Updates and/or Revised Updates" will be paid at the Contract unit price per each approved CPM schedule update as described above. Price and payment will constitute full compensation for preparing, submitting and resubmitting all CPM updates, for attendance at all scheduling meetings with the Department, for preparing and reviewing a list of actual start and actual finish dates with the Engineer, and for all labor, tools, Equipment and incidentals necessary to complete the Work.

2/11/2015

763510 - SITE FURNISHINGS

Description:

This work consists of providing and installing the site furnishings as indicated on the Plans and this specification.

Pedestrian/Bicycle Traffic Counter

The Pedestrian/Bicycle Traffic Counter consists of the installation of a counter for collecting and storing pedestrian and bicycle volume counts at location(s) as shown on the plans.

Submittals - Manufacturer's shop drawings and specifications shall be submitted to the Engineer for approval prior to manufacture and/or ordering. The Engineer shall retain the right to reject Pedestrian/Bicycle Traffic Counters not conforming to this specification and/or approved submittal drawings.

Materials:

The counter shall be weatherproof and shall operate in a temperature range of minus 40°F to 140°F. It shall be operated with batteries that can operate continuously for five years. If such extended life batteries are not available, then batteries that have a life of no less than one year shall be used. The detection range of the counter shall be a minimum of 15 feet in length. The counter shall be capable of recording at varying speeds, including those exceeding 20 miles per hour.

The counter shall collect and store bicycle volume counts by direction for a minimum of one year to an accuracy of plus or minus 5 percent. Time for this data shall be reported in a minimum of 15 minute increments on a 24 hour clock and also be capable of storing hourly and daily volumes. The collection device shall be capable of displaying the volume count data and the location of the retrieval device.

The data shall be stored in a format such that is compatible with the Chaparral TRADAS data collecting and operating system and can be directly exported to Microsoft Excel. The field collection device shall provide a way to download data (such as a direct modem link between the counter and a networked personal computer) such that data can be accessed at any time from multiple computers without having to visit the site location.

The counter shall be installed in the ground in a weathertight handhole with minimum dimensions of 12" x 8" x 8".

Loop sealant shall conform to manufacturer's recommendations and curing temperatures.

Construction Methods:

A minimum of two weeks prior to the installation of the traffic counter, the Contractor shall contact the Engineer to coordinate the date that the counter will be installed. Unless the Engineer states in writing that the manufacturer is not needed on site, a representative of the manufacturer shall also be on site to ensure proper installation. Loop sealant also shall not coagulate prior to installation and shall be spread out across the loop installation area with a sealant spreader tool such that the sealant is flush with the roadway or trail surface. The Contractor shall locate and test for all buried and overhead utilities, which may interfere with the planned location of the counter. The Contractor shall contact "Miss Utility" for location of member utilities at least three working days prior to any excavation, not including the day of actual notice.

The Contractor shall also locate non-member utilities, such as storm drains and swales. All utility conflicts encountered with the proposed installation shall be brought to the attention of the Engineer. Loops shall be sealed with a two-part self-curing, self-bonding weatherproof epoxy approved for sealing loops. Loops shall be 6 feet by 6 feet.

Once the installation is complete, the contractor is required to test the loops to determine if the loop devices are detecting properly. This may require the contractor have a bicycle on-site for testing purposes.

The location of the counters shall be as close to the locations shown on the Plans. However, actual locations may vary such that the counters are not located near bodies of water, near overhead power lines, or are pointing towards vehicular traffic. Exact locations shall be as approved by the Engineer. Once the placement is determined, the loop cutting lines will be drawn on the roadway or trail surface with chalk or a visible marker so that the contractor can then follow the saw cutting lines during installation. The saw cut for the loops shall be made 3/8 inch wide and 3-½ inches deep. The saw slot shall be as straight as possible and shall not vary more than ½ inch when checked with a straightedge. No more than one set of loop lead wires shall be placed in one saw slot. The number of turns of paired loop wire shall be in accordance with manufacturer's recommendations. Saw cuts shall be hydro-blasted with a mixture of water and air and then blown free of water and debris with compressed air, using a large capacity air compressor of at least 150 CFM. The cuts shall be dry prior to placement of loop wire.

The piezo lead wire shall be placed in the saw slot with a blunt non-metallic object. One half inch backer-rod shall be installed to insure the wire does not float to the surface during grouting. Backer-rod shall be installed in 4 to 6 inch pieces with 1 to 2 foot gaps in-between, to ensure the sealant will come in contact with the piezo lead wire. One continuous piece of backer-rod will not be allowed.

Loop lead wires from pavement edge to handhole shall be enclosed in ¾ inch PVC conduit or ¾ inch rubber hose to protect wire from abrasion. Loop lead-in pairs from pavement edge to handhole, shall be symmetrically twisted 5 turns per 1 foot (or whatever the counter manufacturer recommends). Handholes shall contain a minimum of 3 feet of loop lead wire for splicing. All loop and loop leads shall be clearly labeled in all handholes.

The Contractor shall follow all environmental regulations and best management practices during the saw cutting and installation of the loops. All damages or penalties associated with failing to meet environmental requirements shall be at the Contractor's expense.

Acceptance will be based on the Contractor performing a complete test of the counter to ensure that it is functioning correctly and is fully operational. Non-functioning systems will be repaired or replaced at the Contractor's expense.

Size: Approximately 6 ½" in diameter x 2 ½" tall and weighing approximately 2 pounds.

Method of Measurement:

The quantity of site furnishings will not be measured.

Basis of Payment:

The quantity of site furnishings will be paid for at the Contract lump sum price. Price and payment will constitute full compensation for furnishing and installing all materials, labor, tools, equipment, and incidentals required to complete the work.

10/21/13

763522 - COAST GUARD SPECIFIC CONDITIONS

Description:

The Contractor shall prosecute his work in accordance with the specific requirements imposed by this Special Provision.

Under this item the contractor will be required to:

1. Prepare and furnish three copies of a plan and schedule for his operations within the waterway, for submission to Commander (AOWB), 5th Coast Guard District, 431 Crawford St., Portsmouth, VA 23704 for approval. The Contractor shall comply with all provisions of the Inland Rules of the Road. The Contractor shall give written notice to the Coast Guard of any planned temporary obstruction to the waterway navigation as well as copies of the plan and schedule of operations at least 30 days in advance of commencement of the work.

The plan and schedule of operations within the waterway shall include:

(a) A sketch of the waterway indicating:

(1) Locations of all restrictions that will be placed in the waterway, such as barges, anchors and anchor lines.

(2) The location and height above high mean water of any scaffolding or netting.

(b) A projected set of dates and length of time each operation will take, hours of each operation and whether or not the equipment will be removed at night.

2. Give immediate notice to the Coast Guard and to the Department, of any material, machinery or equipment lost, dumped, thrown overboard, sunk or misplaced during the progress of the work. The Contractor must remove the object with utmost dispatch. Until removal can be affected, the object or objects shall be properly marked in order to protect navigation. Notices to the Coast Guard and to the Department shall give a description and location of any such object and the action taken or being taken to protect navigation.

3. Furnish and install temporary obstruction lights as may be required by his operation and his permanent construction under this contract. Each temporary light shall consist of battery or power operated slow flashing amber light less than 60 flashes per minutes and visible for a range of 4 nautical miles on 90% of the nights of the year. Generally a lamp of 20 candle power will meet these requirements. If necessary to obtain the coverage required, a light or lights on the upstream and downstream sides shall be installed. Bridge piers shall be so marked until the construction has been completed and permanent navigational lights have been installed and determined to be operating satisfactorily. Four copies of Plans showing the proposed temporary lights during construction shall be submitted to the Department for approval before work is commenced. Deviations from the prescribed temporary lights during periods of construction will be permitted only upon written Coast Guard approval.

In the event the Contractor fails to comply with these foregoing requirements and the Federal Government is required to take action in this matter for the protection of navigation, the Department reserves the right to recover costs for such work from the Contractor.

The Federal Government and the Department assume no responsibility for any damage sustained or caused by the Contractor's plant, equipment or barges being anchored or moored at the aforementioned location and approval by either agency shall not act as a waiver of liability for any damage that may result from the Contractor's operation.

The Contractor shall maintain the temporary obstruction lights on permanent construction until permanent navigational lights have been installed and made operable in accordance with the Coast Guard requirements.

Basis of Payment:

All work and the Contractor's costs in every respect for compliance with the specific conditions imposed by the Coast Guard Commandant and specific under this item, together with the maintenance and removal of the temporary obstruction lights, installing of permanent navigational lights, and all else in connection therewith and incidental thereto which is not provided for under any stipulated pay item "Coast Guard Specific Conditions", which price and payment shall constitute full compensation for furnishing and installing all materials as described herein.

11/2/06

763620 - PROTECTION OF EXISTING UTILITY BY CONTRACTOR

Description:

This item shall consist of furnishing all labor, materials, tools and equipment to monitor subsurface soil conditions around the existing seventy-eight (78) inch Christina River Force Main (CRFM) concrete sewer pipe shown in the Plans. The work shall also include taking all necessary precautions to protect the CRFM sewer pipe against adverse impacts associated with ground settlement and vibrations as a result of the planned construction activities, including, but not limited to, the construction of any temporary works over and/or adjacent to the CRFM.

Note that the structural integrity of the CRFM sewer pipe is unknown.

At a minimum, one multipoint borehole extensometer, two seismographs and one manual inclinometer shall be installed within ten (10) feet from the edge boundaries of the CRFM to monitor the effects from the planned construction activities.

Definitions:

A. Frequency of Monitoring: The number of readings obtained from a geotechnical instrument with respect to time, defined as at least one reading daily.

B. Geotechnical Instruments: Devices measuring ground movements in the vicinity of existing CRFM adjacent to the planned elevated bridge structures. Instruments include measurement devices and appurtenant equipment, probes, sensors, cables, readout devices, and data loggers; including ancillary facilities required for their operation, such as boreholes, casings, housings, and covers.

C. Inclinometer: Probe lowered within a specially grooved casing to monitor horizontal ground displacements occurring during construction relative to a fixed position at the bottom of the casing or borehole.

D. Multiple Position Borehole Extensometer (MPBX): Device for monitoring the changing distance between anchor points in a borehole and a reference head at the borehole collar.

E. Seismograph: Instrument that makes a record of seismic waves caused by a ground-shaking phenomenon or vibration event, and translates the record into a PPV estimate.

F. Peak Particle Velocity (PPV): The maximum recorded particle velocity from any one of the three axes of movement (vertical [Vv], horizontal [Vh], and transverse [Vt]) for a recorded vibration event.

G. Baseline reading: The first stable reading set obtained after instrument installation, but prior to initiating any planned construction activity within the Limits of Construction, to which all subsequent readings will be compared.

H. Maximum Level: The "Maximum" level is a maximum permissible geotechnical instrument reading that corresponds to a potential temporary work stoppage.

Quality Assurance:

The Contractor shall provide instrumentation personnel with the qualifications specified herein:

1. Instrumentation personnel shall include a Geotechnical Instrumentation Engineer (GIE) who is a registered Professional Engineer in the State of Delaware. The GIE shall demonstrate previous successful experience in installation and monitoring of instruments as those specified herein, and supervision of instrumentation monitoring programs similar in magnitude and for relatively similar subsurface conditions. The GIE shall:

    a. Prepare submittals related to geotechnical instrument installations and monitoring program.

b. Prepare detailed step-by step procedures and data flow chart for the recording and reporting of measurements from the geotechnical instruments.
c. Be on-site to supervise the installation for each instrument.
d. Conduct the pre-installation and post-installation tests to check adequacy and reliability of each instrument prior to and during construction.
e. Be available to manage the repair and replacement of damaged instruments.
f. Demonstrate the operation of the geotechnical instruments.
g. Supervise data collection, reduction, plotting, and reporting, except for survey data.
h. Be available to participate in discussions with the County and the Department pertaining to items related to the instrumentation, monitoring systems and data.
i. Screen data to ensure validity.
j. Be available to manage the repair and replacement of damaged system components.

2. Registered Land Surveyor in the state of Delaware with experience in measurements of the types and accuracies specified herein. The field survey party chief shall also have experience in survey measurements of the types and accuracies specified herein.

The Contractor's instrumentation personnel including the GIE, Registered Land Surveyor, field survey party chief, and all other field and office personnel shall be subject to the review of the Department. If requested by the Department, the Contractor shall replace, at no additional cost to the Department, any person in these positions who fails to perform their required tasks as defined herein.

The Contractor shall provide new instruments, accompanied with the manufacturer's calibration certification and specifications.

Continuously maintain all geotechnical instruments in proper working condition and within manufacturer's specifications. Immediately repair or replace malfunctioning equipment. All instrumentation readout devices to be periodically tested and recalibrated as recommended and approved by the instrument manufacturer.
Submittals:

The Contractor shall develop two (2) copies of a documentation package and submit to the Department for review at least two (2) weeks before installation of any geotechnical instrumentation and prior to the preconstruction meeting, containing the following documents:

1. Resumes of GIE, Registered Land Surveyor and field survey party chief, sufficient to define details of relevant site experience.

2. Resumes of other field and office geotechnical instrumentation personnel to be assigned to the project.

3. List of three or more projects of similar size and complexity where the GIE 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 the preconstruction meeting:

   a. Project Name, Location, Project Description, and Completion Date.
   b. Surface and Subsurface Conditions.
   c. Type and number of instruments installed.
   d. Installation equipment and techniques utilized when applicable.
   e. Provide names, current phone numbers, and current business addresses for the owner/designer, geotechnical consultant, and contract manager.

4. Plan of the proposed geotechnical instrumentation locations.

5. Schematic drawings showing physical locations of all geotechnical instruments relative to the 78 inch CRFM.

6. Manufacturers' product data describing the corresponding instrument to be installed, including requests for consideration of substitutions. Include the factory calibration and manufacture's equipment certification. All instrumentation materials and instrumentation equipment shall be new.

7. Detailed step-by-step procedure for installation including a sample installation record sheet. The installation procedures shall include:

    a. Method to be used for cleaning the inside of casing or augers.
    b. Specifications for proposed grout mixes, including commercial names, proportions of admixtures and water, mixing sequence, mixing methods and duration, pumping methods and tremie pipe type, size and quantity.
    c. Drill casing or auger type and size.
    d. Depth increments for backfilling boreholes with sand and granular bentonite.
    e. Method of sealing joints in pipes to prevent ingress of grout.
    f. Method for conducting post installation acceptance test.
    g. The installation record should note any unusual conditions observed during installation.
    h. A schedule indicating the proposed time sequence of instrument installation.
    i. A schedule showing the proposed start date and time for initializing the monitoring program and planned construction activities. Instruments shall be read daily.
    j. An outline of the weekly geotechnical instrumentation report.

Instruments shall be installed, initialized and accepted a minimum of five (5) working days prior to mobilization of construction equipment. Within three (3) working days of installing all instruments, the Contractor shall submit the following documents to the Department for review:

1. The installation record sheet for that instrument, including post-installation acceptance test.
2. As-built location plan of the surveyed instrument locations.

A minimum of two (2) instrumentation readings that are a minimum of 12 hours apart shall be obtained prior to initiating construction activities within 50 feet from the closest edge of the CRFM. These readings shall not be considered baseline readings. Once construction begins, provide a weekly geotechnical instrumentation report showing all readings collected at the frequency of monitoring during any construction associated activity within fifty (50) feet of the closest edge of the 78 inch CRFM.

Preconstruction Survey:

The preconstruction survey shall take place on site at least one week prior to mobilizing any construction equipment, and be performed in the present of the County and the Department or Authorized Representative of each agency. During the preconstruction survey, the Contractor shall:

1. The Contractor shall locate and maintain the boundaries of the existing 78 inch CRFM, including its centerline, clearly marked for the entire length of the utility enclosed within the limits of disturbance or construction (LOD or LOC) shown in the Plans and duration of the contract.

2. The Contractor's GIE shall prepare a stenographic and photographic record of the existing ground conditions within the field located utility and installed geotechnical instrumentation. This record shall include measurements, sketches, and photographs. Photographs shall be 8 x 10 inch size and in color.

3. The Contractor shall obtain instrumentation readings upon the County and Department's request.

Once the preconstruction survey is completed to the satisfaction of the County and the Department, a notarized statement certifying the date the preconstruction survey was made shall be furnished by the Contractor's GIE to the Engineer. This certification shall include a statement that the preconstruction survey was made in the presence of and to the satisfaction of the County and the Department.

The Contractor's GIE shall develop a written report of the survey, including the photographs, stenographic records, instrument readings taken in the presence of both the County and the Department, and the official baseline readings of each instrument. At least two (2) copies of the report shall be furnished to the Engineer for review and acceptance prior to mobilizing construction equipment to the site. The report shall also include details of the proposed procedures that will be used during construction operations to avoid triggering maximum level readings, procedures used to direct the construction activities to eliminate the occurrence of damage due to construction activities, and procedures to protect instrumentation during the duration of construction activities within fifty (50) feet from the closest edge of the CRFM.

Materials (Geotechnical Instrumentation):

1. Multiple Position Borehole Extensometer (MPBX):

    a. Provide a MPBX with electrical transducers, mechanical and electrical readout devices, and accessories, as manufactured by Geokon, Inc., Roctest, Inc., Slope Indicator Co., or acceptable equivalent.

    b. Extensometer rods shall be flush-coupled stainless steel encased in PVC pipe. Anchors shall be the mechanical or packer type. Transducers shall be either DCDT or linear potentiometer transducers, with a minimum range of 6 inches for settlement and 2 inches for heave. The head shall include a method for backup mechanical reading concurrent with electrical readings, without disturbing electrical connections or transducers.

    c. Provide cable from the same commercial source as the extensometers. Cable shall be as specified by the manufacturer of the instrument, and shall be a shielded cable with a waterproof jacket.

    d. Provide electrical readout and other terminal units, from the same commercial source as the extensometers. Readout devices shall consist of an electronic portable readout unit capable of measuring depths to anchor rods to an accuracy of ±0.001 inch over a range of 8 inches.

    e. Provide mechanical readout unit, with a calibration standard, from the same commercial source as the extensometers.

    f. Provide direct burial PVC jacketed-type cabling for remote readouts.

    g. Each reference head shall be equipped with an instrumentation identification tag that clearly displays the unique instrument number.

2. Inclinometer

    a. Inclinometer casing shall be 2.75-inch O.D. ABS plastic casing for installation in the ground, internally grooved to receive the inclinometer. Manufacturer shall be Slope Indicator, Roctest, Inc., or acceptable equivalent.

    b. Manual inclinometer probe shall be a portable inclinometer probe and shall be biaxial consisting of two force balance accelerometers mounted at 90-degrees with a two foot wheelbase. The probe shall be provided with a pulley from the same manufacturer as the probe.

    c. Couplings, locking devices, caps and grout shall be the sizes and types as recommended by the manufacturer.

3. Seismographs

    a. Provide two portable seismographs for monitoring the velocities of ground vibrations resulting from construction activities. Provide model DS-477 Blastmate II as manufactured by Instantel Inc., Kanata (Ottawa), Ontario, Canada, model VMS-SOO as manufactured by Thomas Instruments Inc., Model SSU 2000DK as manufactured by P.R. Berger & Associates, or acceptable equivalent. The seismograph shall have the following minimum features:

        1. Seismic range: 0.01 to 4 inches per second with accuracy of ±5 percent of the measured peak particle velocity or better at frequencies between 10 Hertz and 100 Hertz, and with a resolution of 0.01 inch per second or less.

        2. Acoustic range: 110 to 140 dB (referenced to 20 micro-Pascals) with an accuracy and resolution of ±1 dB.

        3. Frequency response (±3 dB points): 2 to 200 Hertz.

        4. Three channels for vibration monitoring plus a fourth channel for overpressure.

5. Two power sources: internal rechargeable battery and charger and 115 volts AC. Battery must be capable of supplying power to monitor vibrations continuously for up to 24 hours.

6. Capable of internal dynamic calibration.

7. Direct writing to printer and capability to transfer data electronically. Instruments must be capable of producing strip chart recordings of readings on site within 1 hour of obtaining the readings. Provide computer software to perform analysis, produce reports of continuous monitoring, and to perform zero-crossing frequency analyses of waveform data on magnetic disks.

8. Self-triggering wave form capture mode that provides the following information: plot of wave forms, peak particle velocities, peak overpressure, frequencies of peaks.

9. Continuous monitoring mode must be capable of recording single-component peak particle velocities, and frequency of peaks with an interval of 1 minute or less.

Installation of Geotechnical Instruments:

A. General Installation Requirements:

The Contractor's instrumentation personnel shall install instruments that remain fully functional over the duration of the Contract. Install instruments in accordance with the detailed step-by-step procedures that were submitted and reviewed by the Engineer. Any component that fails to give reliable readings shall be replaced by the Contractor at no additional cost to the Department.

The Contractor shall notify the Engineer at least 24 hours prior to installing each instrument.

All installations shall be monitored by the GIE or authorized representative. As each instrument is installed, an installation record sheet shall be prepared, including appropriate items from the following list:

1. Project name.
2. Contract name and number.
3. Instrument type and number, including readout unit.
4. Planned location in horizontal position (coordinates) and elevation.
5. Planned orientation.
6. Planned lengths and volumes of backfill.
7. Personnel responsible for installation.
8. Plant and equipment used, including diameter and depth of any drill casing or augers used.
9. Date and time of start and completion.
10. Spaces on record sheet for necessary measurements or readings required at hold points during installation to ensure that all previous steps have been followed correctly, including instrument readings made during installation.
11. A log of subsurface data indicating the depths and elevations of strata changes encountered in the borehole. Strata soil nomenclature shall be based on boring logs contained in the Plans.
12. Type of backfill used.
13. As-built location in horizontal position and elevation including:
    a. Elevation referenced to the NAVD 88 datum, together with the location of the point used for the elevation measurement.
    b. Survey coordinates for horizontal position shall be referenced to the enclosed limits of the 78 inch CRFM within the project's Limits of Construction centerline station and offset, together with the survey coordinates of the point used for horizontal position measurement.
14. As built orientation.
15. As built lengths and volumes of backfill.
16. Result of post installation acceptance test.
17. Weather conditions at the time of installation.
18. A space on record sheet for notes, including problems encountered, delays, unusual features of the installation, and details of any events that may have a bearing on instrument behavior.

Installation procedures for instruments in boreholes shall be such that all steps in the procedure can be quality assured. Granular bentonite shall be placed in depth increments not exceeding two (2) feet.

Volumes of each increment of backfilling with sand shall be small enough such that no bridging occurs. The depth to the top of each increment of sand or granular bentonite shall be checked after placement.

Grout shall be placed using a tremie method with side discharge ports on the tremie pipe.

Prior to installing any instrument through drill casing or augers, all material adhering to the inside of the casing or augers, and all cuttings, shall be removed thoroughly.

Whenever withdrawing drill casing or augers during instrument installation in a borehole, care shall be taken to minimize the length of unsupported borehole and the rate of casing or auger withdrawal. The instrument shall be installed in the borehole in a continuous operation. Partially completed instrument installations shall not be left in unsupported boreholes overnight.

B. Installation of Movement Detection Instruments:

1. Multiple Position Borehole Extensometer (MPBX):

Install a Multiple Position Borehole Extensometer and make functional not less than one week before beginning construction. In the presence of the Engineer, demonstrate that the MPBX is functioning properly.

Assemble reference head, anchor rods and anchors. Upper tips of anchor rods shall be assembled such that they are approximately 2 inches below the fixed readout head surface.

Fix anchors into position within the borehole. The anchor positions shall be within 6 inches of the CRFM invert and crown. Location and depth of each relevant utility shall be field verified prior to the installation of the anchor.

The initial transducer setting shall be such that one quarter of the gage range is available for monitoring compressive movement between anchor and head, and three quarters for monitoring extension.

Prior to installation of electrical transducers, perform pre-installation acceptance test with a gage block.

After extensometer installation, verify that there is no obstruction to the smooth movement of anchor rods within their protective sleeves. Perform post-installation acceptance test, by reading the transducer, to ensure correct functioning.

After completion of installation, establish a baseline reading. A baseline reading for the MPBX will consist of the average of a minimum of three (3) stable readings over a 24 hour period. Sufficient baseline readings shall be performed to the satisfaction of the County and the Department.

After completion of installation, the as-built survey coordinates for horizontal position shall be determined to an accuracy of ±0.01 foot and the elevation of the top of the riser pipe to an accuracy of ±0.01 foot.

2. Inclinometer:

Install Inclinometers and make functional not less one week before beginning construction. In the presence of the Engineer, demonstrate that each inclinometer is functioning properly.

After installation, the casing groove spiral shall not exceed one degree per 10 feet of length, the orientation of the grooves at the top of the casing shall be within 10 degrees of the planned orientation, and no part of the casing shall deviate from vertical by more than 4 percent of the depth to that part.

Install in borehole of adequate size for inclinometer casing installation.

One set of grooves, defined as the A-axis, shall be oriented perpendicular to the utility. Casing groove orientation shall be maintained throughout installation.

After completion of installation, a post-installation acceptance test shall be performed to verify that there is no grout in the inclinometer casing, that groove orientation and verticality are correct, and that the inclinometer probe tracks correctly in all four orientations.

After completion of installation, establish a baseline reading. A baseline reading for an inclinometer will consist of the average of a minimum of three (3) stable readings over a 24 hour period. Sufficient baseline readings shall be performed to the satisfaction of the County and the Department.

After completion of installation, the as-built survey coordinates for horizontal position shall be determined to an accuracy of ±0.01 foot and the elevation of the top of the riser pipe to an accuracy of ±0.01 foot.

C. Installation of Vibration Detection Instruments: Seismographs

The Contractor shall place one seismograph at each side of the CRFM to monitor ground vibrations. Each seismographs shall be placed over a firm and flat surface, at least 6 inches below the ground surface and protected with open ended construction barrel. All gaps between the seismograph and protective barrel shall be carefully backfilled with site soil cuttings.

Baseline background seismograph readings shall be taken prior to the beginning of construction activities. Baseline readings shall consist of a minimum of three (3) days of continuous monitoring of single-component peak particle velocities, which shall be printed on a strip chart. These readings are the stenographic record required during preconstruction survey, which must be included in the preconstruction survey report. During this period, the Contractor shall document all events that are responsible for the measured vibration levels. Particle velocities shall be read with a minimum sensitivity of 0.01 inch/second.

The Contractor shall collect seismograph data at the start of construction activities to establish the maximum energy which can be used without surpassing maximum vibration levels at the utility.

The Contractor shall also monitor vibration during construction. The Contractor shall notify the Engineer at least 24 hours prior to starting any new operations suspected of being capable of inducing vibration.

After completion of installation, the as-built survey coordinates for horizontal position shall be determined to an accuracy of ±0.01 foot.

Site Monitoring:

Vibrations and ground movements shall be monitored in the vicinity of the 78 inch CRFM with the specified geotechnical instruments at the respective Frequency of Monitoring or as determined and agreed upon by the County and the Department. Vibrations and ground movements at the geotechnical instruments resulting from the Contractor's operations shall be controlled so that the maximum levels are not triggered at any time throughout the planned construction activities within fifty (50) feet from the closest edge of the CRFM.

The Contractor's proposed plan for the vibration and ground movement monitoring and the report of the preconstruction survey for the utility shall be submitted to the Department with two copies submitted to the Engineer for approval. The plan shall include the type and layout of sensing devices. The proposed methods and plans shall be approved prior to any construction activity. Approval by the Engineer of the proposed vibration monitoring and preconstruction survey does not relieve the Contractor of any responsibility for damage to the utility that were included or omitted from the Contractor's GIE monitoring program.

The GIE shall record vibrations and ground movements during all construction operations, or any other activity that may cause excessive ground disturbance within fifty (50) feet from the outer edge of the utility. The GIE shall direct the construction activities in order to eliminate triggering maximum levels of reading within the installed geotechnical instrumentation.

When the GIE or the Engineer determines that any construction activity has an adverse effect on the CRFM by reaching the maximum levels of reading, the construction activity operations shall be suspended while corrective action is being taken. The instrumentation readings shall continue throughout entire construction duration.

Maximum Levels of Reading:

The Contractor's work activities shall not produce readings exceeding the maximum levels of reading defined as follows:

- Ground movements within the crown and invert of pipe: equal or greater than 1/32 inches.
- Ground vibrations or PPV: equal to or greater than 0.2 inches per second.

Method of Measurement:

The item of work Protection of Existing Utility by Contractor will not be measured.

Basis of Payment:

The quantity of Protection of Existing Utility by Contractor will be paid for at the Contract lump sum price for item 763620. Price and payment will constitute full compensation for all of the work required including the instrumentation personnel, the successful installation of the specified geotechnical instruments, preconstruction survey and field location of existing utility boundaries, including centerline, site monitoring prior to and during construction in the vicinity of the utility boundaries, the required reporting of all measurements from each geotechnical instrument to the Engineer as specified herein, submission of written reports, site monitoring, and all materials, labor, equipment, tools, and incidentals necessary to complete the work.

12/7/15

905500 - SUPER SILT FENCE

Description:

This work consists of furnishing, installing, constructing, maintaining, and ultimately removing super silt filter fences as a temporary measure to control sedimentation within the limits of construction. Super silt fence shall be constructed as shown on the details in the Plans, at the locations shown on the Plans, and as directed by the Engineer.

Materials:

General. All materials shall be approved prior to use by the Department's Materials and Research Section.

Chain Link Fence. The construction requirements for the placement of the chain link fence shall be as specified in **SECTION 727 FENCES AND GATES** with the following exceptions:

(a) Concrete footings (727.07), Top Rail, Tension Wire, Horizontal Braces shall not be used.

Fasteners. Aluminized steel tie wires long enough to securely attach the fabric to the posts.

Seed. Seed shall conform to the requirements of Section 908.

Mulch. Mulch shall conform to the requirements of Section 908.

Geotextile. Geotextile shall conform to the requirements of Section 827. It shall be a minimum of 36" (900 mm) wide.

Construction Methods:

Construction of Super Silt Fence.

The Contractor shall excavate the trench along the upstream side of the post line as shown on Standard Construction Detail, Super Silt Fence. Posts shall be installed on the Downstream edge of the trench, along the established fence line. The geotextile shall be fastened to the upstream side of the chain link. The geotextile and chain link must extend a minimum of 33” above the ground. The chain link fabric and geotextile shall be embedded 8 inches into the excavated trench. The trench shall be backfilled and compacted over the chain link and geotextile to prevent water from flowing under the chain link and geotextile.

The super silt fence shall not be constructed across a ditch, or swale, or area of concentrated flow. On slopes, the terminal ends of super silt fence shall be turned upslope a sufficient distance to eliminate flow around the ends of the super silt fence. All geotextile damaged prior to installation, during installation, or during the life of the Contract shall be repaired or replaced
to the satisfaction of the Engineer.

Maintenance of Super Silt Fence.

Throughout the Project construction period, the super silt fence shall be maintained by removing trapped sediment. The Contractor shall clean the geotextile of trapped sediment by tapping the geotextile when dry. No trash shall be allowed to accumulate to the height of the fence. Any geotextile that does not function due to clogging or deterioration shall be replaced.

Sediment Removal.

After every heavy rainfall, the Contractor shall check for excessive buildups of sediment which must be removed so that the super silt fence can continue to function as intended. Remove accumulated sediment when it reaches 50% of the height of the super silt fence.

Removal of Super Silt Fence.

The super silt fence shall be removed when the Engineer determines that it is no longer required. The super silt fence and all materials incidental to the super silt fence construction shall be removed. All areas affected by the construction of the super silt fence shall be restored to the original or plan contours and stabilized with seed and mulch.

Method of Measurement:

The quantity of super silt fence will be measured as the actual number of linear feet (linear meters) of super silt fence placed and accepted.

Basis of Payment:

The quantity of super silt fence will be paid for at the Contract unit price per linear foot (linear meter) for each type of fence. Price and payment will constitute full compensation for furnishing all materials; for excavating and backfilling associated with the construction of the super silt fence; for maintaining the super silt fence during the Project construction period; sediment removal, for removing the super silt fence with all related hardware after completion of the Project; for restoring the site; for seeding and mulching; and for all labor, equipment, tools and incidentals required to complete the work. No payment will be made for any replacement of or repairs to the super silt fence damaged prior to installation, during installation, or during the life of the Contract. No payment will be made for the replacement of the super silt fence.

11/18/2014

908512 - TEMPORARY GRASS SEEDING - WET GROUND (TGS-WG)

Description:

This work consists of furnishing and placing seed. Unless specified on the plan, no mulch will be placed.

Materials:

Temporary Grass Seeding - Wet Ground (TGS-WG).

Species Name Common / (Latin)	Max. % Weed Seeds	Min. % Purity	Min. % Germination	Seeding Rate lb/Ac
Annual Barnyard Grass/Duck Millet (*Echinocloa* spp.) *Echinocloa muricata* or *Echinocloa walteri* are preferred	1.00	90	90	40
Total Seed Quantity (lb/ac)				40

All seed shall be fresh, clean, from new crop seed, and delivered to the site in original unopened tagged packages in accordance with the Delaware Code and respective State laws.

Small Grain Straw: Straw for mulching will be from oats, wheat, rye, or other approved grain crops that are free from noxious weeds, mold, or other objectionable material. Straw mulch will be in an air-dry condition and will be suitable for placing with an approved mechanical blower.

Construction Methods:

Application of the Temporary Grass Seeding - Wet Ground Mix shall only occur between the following dates:

May 1 to October 1.

Seed may be broadcast or hydroseeded. No lime or fertilizer will be added. Unless specified on the plans, no mulch will be applied.

If specified on the plans, small grain straw will be uniformly and evenly applied immediately after seed has been placed. An approved mechanical blower will be used to apply the straw. Straw mulch applied by blowers will provide a loose depth of not less than 1/2 nor more than 2". Ninety-five percent of the blown and shredded straw mulch will be 6" or more in length when in place.

Straw mulch will be applied uniformly and evenly across the seeded area at the rate of 4,000 lb/ac. No crimpling or tracking is required of the seed or straw.

Acceptance of 908512 - Temporary Grass Seeding - Wet Ground (TGS-WG) will be made at time of placement, provided the seed and straw placed as specified herein and as directed on the Plans.

No Maintenance Bond is required for this work.

Method of Measurement:

The Engineer will measure the quantity of acceptably placed permanent seed. The quantity of seeding shall be measured in square yards of surface area.

Basis of Payment:

The quantity and type of seeding shall be paid for at the Contract Unit Price per square yard. Price and payment will constitute full compensation for preparing the ground; for furnishing and placing all materials including seed and mulch; and for all labor, equipment, tools, maintenance bond and incidentals required to complete the work.

Payment will be made at the time seed is acceptably placed.

9/15/2015

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

JENNIFER COHAN
SECRETARY

UTILITY STATEMENT
November 20, 2015
State Contract No. T201330009
F.A.P. No. ESTP-N061(01)
New Castle Industrial Track Trail, Phase 3
New Castle County

The following utility companies maintain facilities within the project limits:

Clear Channel Outdoor
Delmarva Power - Electric
Delmarva Power – Gas
Delmarva Power - Transmission
New Castle County - Sanitary Sewer
United Water of Delaware
Verizon Delaware LLC

The following is a breakdown of the utilities involved, adjustments and/or relocations as required.

CLEAR CHANNEL OUTDOOR

Clear Channel Outdoor owns and maintains electric facilities within the project limits connecting to Clear Channel owned billboards.

Clear Channel Outdoor will relocate aerial electric facilities and poles between STA. 110+50 LT. and 115+50 LT. These poles are noted as "RL/O" (Relocate by Other) on the plans and will be relocated to outside of the trail's alignment.

There are no anticipated impacts to these facilities as part of the construction of the proposed trail.

DELMARVA POWER - ELECTRIC

Delmarva Power owns and maintains electric facilities within the vicinity of the DuPont Environmental Education Center parking lot, located north of the Norfolk Southern railroad and north of the project limits. There are no anticipated impacts to these facilities as part of the construction of the proposed trail.

DELMARVA POWER - GAS

Delmarva Power owns and maintains underground gas facilities within the project limits. A 12-inch gas line is located within a 40-foot wide gas easement.

Delmarva Power will relocate/adjust utility markers and valves at the following locations:

Station	Offset	Feature	Solution
118+13	9.0' RT.	Marker/Valve	Relocate
119+45	12.9' RT.	Marker/Valve	Adjust
121+03	5.0' RT.	Marker/Valve	Relocate
122+68	4.6' LT.	Marker/Valve	Relocate
125+76	15.1' LT.	Marker/Valve	Adjust

There are no other anticipated impacts to these facilities as part of the construction of the proposed trail.

DELMARVA POWER - TRANSMISSION

Delmarva Power owns and maintains aerial transmission facilities within the project limits. The facilities are located within a 100-foot wide transmission easement. The proposed asphalt trail and structures cross within this transmission easement at two locations:

- From approximately STA. 119+45 to STA. 120+63: A section of the proposed at-grade asphalt trail
- From approximately STA. 159+65 to STA. 161+68: The proposed bridge connecting to the existing DuPont Environmental Education Center pedestrian bridge

No construction equipment can be within 20'-0" of the aerial transmission lines.

There are no anticipated impacts to these facilities as part of the construction of the proposed trail.

NEW CASTLE COUNTY - SANITARY SEWER

New Castle County owns and maintains a 78-inch sanitary sewer, the Christina River Force Main (CRFM), within and near the project limits. The sewer is located within a 100-foot wide sanitary sewer easement along the south side of the Norfolk Southern railroad. The sewer enters and crosses the project's limit of construction just west of the DuPont Environmental Education Center.

Special Note: The contractor shall strictly adhere to the New Castle County Christina River Force Main (CRFM) protective measures as noted in the plans and specifications.

There are no anticipated impacts to these facilities as part of the construction of the proposed trail.

UNITED WATER OF DELAWARE

United Water owns and maintains underground water facilities near the project limits. Two water mains, a 20-inch and 30-inch, are located north of the limit of construction and south of the Norfolk Southern railroad.

There are no anticipated impacts to these facilities as part of the construction of the proposed trail.

VERIZON DELAWARE LLC

Verizon owns and maintains underground facilities within the vicinity of the DuPont Environmental Education Center parking lot, located north of the Norfolk Southern railroad and north of the project limits. There are no anticipated impacts to these facilities as part of the construction of the proposed trail.

GENERAL NOTES

1. The Utility Companies and their Contractors do not normally work on weekends or legal holidays.

2. The Contractor's attention is directed to Section 105.09 Utilities, Delaware Standard Specifications, dated August 2001. The Contractor shall contact Miss Utility (1-800-282-8555) two working days prior to any excavation. The Contractor is responsible for ensuring proper clearances, including safety clearances, from overhead utilities for construction equipment. The State's Contractor is advised to check the site for access purposes for his equipment and, if necessary, make arrangements directly with utility companies for field adjustments to provide adequate clearances.

3. 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 or are readily discernible and that no additional compensation will be allowed for any delays, inconvenience, or damage sustained due to any interference from the said utility facilities and appurtenances or the operation of moving them, except that the State's Contractor may be granted an equitable extension of time if determined appropriate by the Engineer. The State's Contractor is responsible for the support and protection of all utilities when excavating in the vicinity of said utilities.

4. 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 otherwise indicated on the plans and/or outlined elsewhere in the Contract Documents.

5. Coordination and cooperation among the Utility Companies and the State's Contractor are of prime importance. Therefore, the State's Contractor is directed to contact the following Utility Company representatives with any questions regarding the proposed work prior to submitting bids and work schedules. Work schedules should reflect the Utility Companies' proposed relocations.

Mr. Jim Farley	Clear Channel Outdoor	(302) 254-3308
Mr. Angel Collazo	Delmarva Power - Electric	(302) 454-4370
Mr. Ted Waugh	Delmarva Power - Gas	(302) 429-3706
Mr. Ray Rouault	Delmarva Power - Transmission	(302) 454-5174
Mr. David Clark	New Castle County - Sanitary Sewer	(302) 395-5741
Mr. John Licht	United Water of Delaware	(302) 252-3036
Mr. George Zang	Verizon Delaware LLC	(302) 422-1238

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

7. In conjunction with bid preparation and prior to starting work, the State's Contractor shall confirm with all respective utility companies noted in this Utility Statement to have advance utility relocations that the advance relocations have in fact been accomplished as summarized herein.

8. As outlined in Chapter 3 of the DelDOT Utilities Manual, individual utility companies are responsible for obtaining all required permits from municipal, State and federal government agencies and railroads. This includes but is not limited to water quality permits/DNREC Water Quality Certification, DNREC Subaqueous Lands/Wetlands permits, DNREC Coastal Zone Consistency Certification, County Floodplain permits (New Castle County only), U.S. Coast Guard permits, US Army Corps 404 permits, sediment and erosion permits, and railroad crossing permits.

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

PREPARED AND RECOMMENDED BY:

Whitman, Requardt & Associates, LLP
Consulting Engineers

11/30/15
Date

APPROVED AS TO FORM:

Delaware Department of Transportation
Utility Coordinator

12/1/15
Date

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

CERTIFICATE OF RIGHT-OF-WAY STATUS

STATE PROJECT NO. T201330009

F.A.P. NO. ESTP-N061(01)

INDUSTRIAL TRACK GREENWAY PHASE III

STATEWIDE

Certificate of Right-of-Way Status - Stipulated

Status - Level 3

The State is requesting authorization for advertisement for bids or force-account work and construction due to the need to advertise this project in early 2016. As required by 23 CFR, Part 635, and other pertinent Federal and State regulations or laws, the following certifications are hereby made in reference to this highway project:

All necessary rights-of-way, including control of access rights when pertinent, have not been fully acquired due to the acquisition or right of occupancy and use of the following remaining parcels not being complete

DP&L 1-R Offer made to owner. Agreement in process.
Anticipated Clearance Date: May 1, 2016

Norfolk Southern Railroad (No Parcel Number)
Railroad agreement in process with RR Company.
Anticipated Clearance Date: May 1, 2016.

NOTE: Construction is due to commence in early July, 2016

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

The State shall ensure that any occupants of residences, businesses, farms, or non-profit organizations or owners of personal property to be removed and who have not yet moved from the right-of-way are protected against unnecessary inconvenience and disproportionate injury or any action coercive in nature.; and,

All occupants of the residences on such parcels as applicable have had replacement housing made available to them in accordance with 49 CFR 24.204; and,

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

Appropriate notification shall be provided in the bid proposals identifying all locations where right of occupancy and use has not been obtained; and,

Any additional project costs resulting from non-availability of right-of-way will be non-participating and,

REAL ESTATE SECTION

Robert M. Cunningham
Chief of Right of Way

December 11, 2015

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

JENNIFER COHAN
SECRETARY

December 8, 2015

STIPULATED

ENVIRONMENTAL REQUIREMENTS

FOR
State Contract No. T201330009
Federal Aid No.: ESTP-N061(01)

Contract Title: Industrial Track Greenway Phase III

In accordance with the procedural provisions for implementing the National Environmental Policy Act of 1969, as amended, the referenced project has been processed through the Department's Environmental Review Procedures and has been classified as a Level D/ Class II Action. As such, a Categorical Exclusion has been prepared to evaluate potential adverse impacts resulting from construction of the proposed project (per 23 CFR 771.117 d(3)) and is consistent with current 23 CFR 771.117 (a) and (d) criteria. The following special provisions have been developed to mitigate and/or minimize these impacts.

PERMIT REQUIREMENTS:

The construction work that will occur involves the construction of a continuous and publically accessible multi-modal commuter bicycle and pedestrian transportation pathway. This section is the third phase of the trail, located between I-495 on the south and the Wilmington Riverwalk on the north, New Castle County, Delaware and requires permit approval from the agencies listed below. It is the responsibility of the contracting agency -- the Delaware Department of Transportation, Division of Transportation Solutions -- to obtain the necessary permits to ensure that the contractor complies with the requirements and conditions established by the regulatory agencies. Written authorization from the permitting agencies is required and paperwork for on-site posting is anticipated. As such, the construction work that will occur for the construction of this trail in New Castle County, Delaware is authorized under the permits/exemptions listed below:

REQUIRED PERMITS AND APPROVAL STATUS:

- U.S. Army Corps of Engineers (COE) - Nationwide Permit (NWP) # 23 Preconstruction Notification (PCN) required – **CENAP-OP-R-2015-0372-1, approved November 6, 2015 (*expires March 18, 2017*)**

- Delaware Department of Natural Resources and Environmental Control (DNREC) – Subaqueous Lands Permit, Wetlands Permit, and Water Quality Certification – **SP-171/15, WE 172/15 and WQ-173/15 - approved November 19, 2015, (*expires November 19, 2018*)**

- **DNREC Coastal Zone Management (CZM)** – Issued (project is not located in Critical Resource Water)

- **New Castle County Department of Lands Use** – Floodplain Approval – **approved August 31, 15**

- **U.S. Coast Guard –** Bridge permit for Christina River and Advance Approval for Little Mill Creek **- Pending**

SPECIFIC REQUIREMENTS:

Compliance with all requirements of the permits is the responsibility of the contractor, who will follow all special conditions or requirements as stated within those permits. The contractor will be subject to penalties, fines, and the risk of shut down as mandated by laws governing permitting agencies if such conditions and requirements are violated or ignored. Therefore, all special conditions, general requirements, and/or other required provisions specified within the permits must be followed. Those obligations are indicated or listed within the permit package, which can be obtained from the DelDOT Contract Administration Office.

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

1. The contractor shall employ measures during construction to prevent spills of fuels or lubricants. If a spill should occur, efforts shall be undertaken to prevent its entry into wetlands, aquatic, or drainage areas. Any spills entering wetlands, aquatic, or drainage areas shall be removed immediately. The Division of Water Resources (DNREC), Wetlands & Aquatic Protection Branch, 302-739-4691, shall be notified of any spill(s) within six (6) hours of its occurrence. That office will determine the effectiveness of spill and contamination removal and specify remediation efforts as necessary.

2. All construction debris, excavated material, brush, rocks, and refuse incidental to the work shall be placed either on shore above the influence of flood waters or on some suitable disposal site approved by the department.

3. The disposal of trees, brush, and other debris in any stream corridor, wetland surface water or any drainage ditch is prohibited.

4. There shall be no stockpiling of construction materials or temporary fills in wetlands or subaqueous lands unless otherwise specified on project plans and approved by permitting agencies that govern them. It is the contractor's responsibility to coordinate and secure those additional permits/amendments in deviating from the plan.

5. Construction debris shall be kept from entering adjacent waterways, wetlands, ground cover, or drainage areas. Any debris that enters these areas shall be removed immediately. Netting, mats, or establishment of confined work areas in stages may be necessary to address these issues.

6. Refuse material resulting from routine maintenance of worker equipment and heavy machinery is prohibited from being disposed or deposited onto or into the ground. All used oils and filters must be recycled or disposed of properly.

7. Use of harmful chemical wash water to clean equipment or machinery is discouraged. If undertaken, the residue water and/or material must be collected or contained such that it will be disposed of properly. It shall not be deposited or disposed of in waterways, streams, wetlands, or drainage areas.

8. The contractor shall follow all requirements as indicated in the Environmental Compliance Sheet. It is the contractor's responsibility to ensure that workers also follow this requirement. As part of the restrictions, please note the timetables reflected in the contract for the in-stream/water work for endangered species protection.

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

ENVIRONMENTAL COMPLIANCE SHEET:

The contractor shall pay special attention to specific construction requirements as indicated in the Environmental Compliance Sheets EC-01 to EC-10 (sheets 161-170).

1. Please note the environmental requirement as indicated in Note 2B Endangered Species (sheet 161) – Fisheries – No in-water work within the Christina River and Little Mill Creek from March 1 to June 30 (inclusive). This is also Special Condition 2 of the U.S. Army Corps of Engineer Permit and Special Condition 11 of the DNREC permit.

2. Please note the environmental requirement as indicated in Note 2B Endangered Species (sheet 161) – Endangered Species – Osprey

3. Please note the environmental requirement as indicated in Note 2B Endangered Species (sheet 161) – Bald Eagle – if nest is active, an eagle spotter is required from December 15 to July 1. Contact Carol Sullivan at Carol.Sullivan@state.de.us; 302-760-2129 to arrange

for an eagle spotter. Tree removal within a 300' buffer shall occur from July 2 to December 14, 2016. This is also Special Condition 12 under DNREC's permit.

4. Please note the environmental requirement as indicated in Note 3 on sheet 161 for Cultural Resource Issues: State Historic Preservation Office Issued a Finding of No Historic Properties Affected on May 15, 2015.

5. Specifically, please note the environmental requirements as indicated on sheet 161 in:

   - Note 4 on for Protection of Resources
   - Note 5 for Restoration
   - Note 6 for Mitigation – This is also Special Condition 2 under DNREC permit.

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

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

JENNIFER COHAN
SECRETARY

RAILROAD STATEMENT
For

State Contract No.: T201330009

Federal Aid No.: ESTP-N061(01)

Project Title: New Castle Industrial Tract Trail Phase III

The following railroad companies maintain facilities within the contract limits:

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

DOT Inventory No.: N/A (AMTRAK) No. Trains/Day: 100 Passenger Trains (Y / N): Y

DOT Inventory No.: 925476F (NS) No. Trains/Day: 6 Passenger Trains (Y / N): N

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

☐ No Railroad involvement.

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

☑ Railroad Agreement required. The necessary Railroad Agreement is pending. The Contractor cannot begin work untill the Agreement is complete and fully executed. Railroad related work to be undertaken and completed as required for proper coordination with physical construction schedules. The Contractor shall follow requirements stated in the DelDOT Maintenance of Railroad Traffic Item in the Special Provisions. Contractor shall coordinate railroad flagging with DelDOT's Railroad Program Manager at (302) 760-2183.

Approved As To Form:

Robert A. Perrine
DelDOT Railroad Program Manager

12/11/15
DATE

BID PROPOSAL FORMS

CONTRACT T201330009.01

FEDERAL AID PROJECT ESTP-N061(01)

CONTRACT ID: T201330009.01 PROJECT(S): ESTP-N061(01)

All figures must be typewritten.

CONTRACTOR :_____

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE DOLLARS	UNIT PRICE CTS	BID AMOUNT DOLLARS	BID AMOUNT CTS
	SECTION 0001 INDUSTRIAL TRACK GREENWAY PHASE III					
0010	201000 CLEARING AND GRUBBING	LUMP	LUMP			
0020	202000 EXCAVATION AND EMBANKMENT	2602.000 CY				
0030	202508 WETLAND ACCESS ROAD, TYPE II	LUMP	LUMP			
0040	207000 EXCAVATION AND BACKFILL FOR STRUCTURES	1500.000 CY				
0050	207500 COFFERDAMS	LUMP	LUMP			
0060	209001 BORROW, TYPE A	109.000 CY				
0070	209006 BORROW, TYPE F	1550.000 CY				
0080	209503 BRIDGING LAYER	2635.000 SF				
0090	211000 REMOVAL OF STRUCTURES AND OBSTRUCTIONS	LUMP	LUMP			

CONTRACT ID: T201330009.01 PROJECT(S): ESTP-N061(01)

All figures must be typewritten.

CONTRACTOR :_____

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS		UNIT PRICE		BID AMOUNT	
				DOLLARS	CTS	DOLLARS	CTS
0100	302007 GRADED AGGREGATE BASE COURSE, TYPE B	461.000	CY				
0110	401800 BITUMINOUS CONCRETE, SUPERPAVE, TYPE C, 115 GYRATIONS, PG 64-22 (CARBONATE STONE)	382.000	TON				
0120	401809 BITUMINOUS CONCRETE, SUPERPAVE, TYPE B, 115 GYRATIONS, PG 64-22	290.000	TON				
0130	601002 TIMBER STRUCTURES (TREATED)	408.000	MFBM				
0140	601003 TIMBER STRUCTURES (GLUE-LAMINATED)	109.000	MFBM				
0150	601004 TIMBER STRUCTURES (GLUE-LAMINATED TIMBER DECK)	3009.000	SF				
0160	601520 TEMPORARY TIMBER MAT	LUMP		LUMP			
0170	601536 PREFABRICATED GLUE LAMINATED TIMBER ARCH	LUMP		LUMP			
0180	601537 HARDWOOD IPE PLANK DECKING	9650.000	SF				

CONTRACT ID: T201330009.01 PROJECT(S): ESTP-N061(01)

All figures must be typewritten.

CONTRACTOR :_____

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS		UNIT PRICE DOLLARS	UNIT PRICE CTS	BID AMOUNT DOLLARS	BID AMOUNT CTS
0190	602002 PORTLAND CEMENT CONCRETE MASONRY, CLASS B	302.000	CY				
0200	602004 PORTLAND CEMENT CONCRETE MASONRY, ABUTMENT FOOTING, CLASS B	63.000	CY				
0210	602006 PORTLAND CEMENT CONCRETE MASONRY, PIER FOOTING, CLASS B	247.000	CY				
0220	602007 PORTLAND CEMENT CONCRETE MASONRY, PIER ABOVE FOOTING, CLASS A	766.000	CY				
0230	602015 PORTLAND CEMENT CONCRETE MASONRY, ABUTMENT ABOVE FOOTING, CLASS A	54.000	CY				
0240	602646 SILICONE ACRYLIC CONCRETE SEALER	8150.000	SF				
0250	602772 MECHANICALLY STABILIZED EARTH WALLS	LUMP		LUMP			
0260	603000 BAR REINFORCEMENT	54119.000	LB				
0270	604000 BAR REINFORCEMENT, EPOXY COATED	58443.000	LB				
0280	605002 STEEL STRUCTURES	LUMP		LUMP			

CONTRACT ID: T201330009.01 PROJECT(S): ESTP-N061(01)

All figures must be typewritten.

CONTRACTOR :_____

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE DOLLARS	UNIT PRICE CTS	BID AMOUNT DOLLARS	BID AMOUNT CTS
0290	605581 ELASTOMERIC BRIDGE BEARING PAD	264.000 EACH				
0300	605758 PREFABRICATED STEEL TRUSS BRIDGE	LUMP	LUMP			
0310	606701 GALVANIZED STEEL WOVEN WIRE MESH INFILL PANELL RAILING	1152.000 LF				
0320	606702 STAINLESS STEEL CABLE RAILING	5510.000 LF				
0330	606703 STAINLESS STEEL RAILING	1485.000 LF				
0340	618535 STEEL H PILES, HP 14 X 89	6660.000 LF				
0350	618536 STEEL H TEST PILES, HP 14 X 89	145.000 LF				
0360	619501 PRODUCTION PILE RESTRIKE	6.000 EACH	500.00000		3000.00	
0370	619502 TEST PILE RESTRIKE	6.000 EADY	1000.00000		6000.00	
0380	619519 DYNAMIC PILE TESTING BY CONTRACTOR	4.000 EACH				

CONTRACT ID: T201330009.01 PROJECT(S): ESTP-N061(01)

All figures must be typewritten.

CONTRACTOR :_____

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE DOLLARS	UNIT PRICE CTS	BID AMOUNT DOLLARS	BID AMOUNT CTS
0390	619520 DRILLED MICROPILES	905.000 LF				
0400	619539 SIGNAL MATCHING ANALYSIS BY CONTRACTOR	4.000 EACH				
0410	619560 MICROPILE PROOF LOAD TEST	5.000 EACH				
0420	619561 STEEL PIPE PILES, 12" DIAMETER	2954.000 LF				
0430	619562 HELICAL PILES	LUMP	LUMP			
0440	619563 HELICAL PILE STATIC LOAD TEST	5.000 EACH				
0450	619564 INSTALL STEEL H PILES, HP 14 X 89	6660.000 LF				
0460	619565 INSTALL TEST PILES, HP 14 X 89	145.000 LF				
0470	621020 TIMBER SHEET PILES - TREATED	2.000 MFBM				
0480	713500 GEOTEXTILE, STABILIZATION, SPECIAL	7570.000 SY				

CONTRACT ID: T201330009.01 PROJECT(S): ESTP-N061(01)

All figures must be typewritten.

CONTRACTOR :_____

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE DOLLARS	UNIT PRICE CTS	BID AMOUNT DOLLARS	BID AMOUNT CTS
0485	720611 FLEXIBLE DELINEATOR, PERMANENT	4.000 EACH				
0490	727014 CONSTRUCTION SAFETY FENCE	600.000 LF				
0495	737523 PLANTINGS	LUMP	LUMP			
0500	743000 MAINTENANCE OF TRAFFIC	LUMP	LUMP			
0510	743023 TEMPORARY BARRICADES, TYPE III	25000.000 LFDY				
0520	743024 TEMPORARY WARNING SIGNS AND PLAQUES	4200.000 EADY				
0530	743050 FLAGGER, NEW CASTLE COUNTY, STATE	320.000 HOUR				
0540	743062 FLAGGER, NEW CASTLE COUNTY, STATE, OVERTIME	80.000 HOUR				
0550	744530 CONDUIT JUNCTION WELL, TYPE 11, PRECAST CONCRETE/ POLYMER LID-FRAME	8.000 EACH				
0560	745508 BRIDGE MOUNTED CONDUIT	LUMP	LUMP			

CONTRACT ID: T201330009.01 PROJECT(S): ESTP-N061(01)

All figures must be typewritten.

CONTRACTOR :_____

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE DOLLARS	UNIT PRICE CTS	BID AMOUNT DOLLARS	BID AMOUNT CTS
0580	745604 FURNISH & INSTALL UP TO 4" SCHEDULE 80 PVC CONDUIT (TRENCH)	3310.000 LF				
0583	746559 BRIDGE LIGHTING AND POWER	LUMP	LUMP			
0585	746590 FURNISH & INSTALL GROUND ROD	1.000 EACH				
0590	746596 JUNCTION BOX ON STRUCTURE	22.000 EACH				
0593	747500 LIGHTING CONTROL CENTER PAD	1.000 EACH				
0610	759511 FIELD OFFICE SPECIAL II	18.000 EAMO				
0620	762001 SAW CUTTING, BITUMINOUS CONCRETE	50.000 LF				
0630	763000 INITIAL EXPENSE	LUMP	LUMP			
0640	763501 CONSTRUCTION ENGINEERING	LUMP	LUMP			
0650	763508 PROJECT CONTROL SYSTEM DEVELOPMENT PLAN	LUMP	LUMP			

CONTRACT ID: T201330009.01 PROJECT(S): ESTP-N061(01)

All figures must be typewritten.

CONTRACTOR :_____

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE DOLLARS	UNIT PRICE CTS	BID AMOUNT DOLLARS	BID AMOUNT CTS
0660	763509 CPM SCHEDULE UPDATES AND/OR REVISED UPDATES	18.000 EAMO				
0670	763510 SITE FURNISHINGS	LUMP	LUMP			
0680	763522 COAST GUARD SPECIFIC CONDITIONS	LUMP	LUMP			
0683	763620 PROTECTION OF UTILITY BY CONTRACTOR	LUMP	LUMP			
0690	905001 SILT FENCE	2900.000 LF				
0700	905500 SUPER SILT FENCE	1200.000 LF				
0710	906002 DEWATERING BAG	4.000 EACH				
0720	906003 SUMP PIT	4.000 EACH				
0730	908004 TOPSOIL, 6" DEPTH	8567.000 SY				
0750	908023 STABILIZED CONSTRUCTION ENTRANCE	60.000 TON				

CONTRACT ID: T201330009.01 PROJECT(S): ESTP-N061(01)

All figures must be typewritten.

CONTRACTOR :_____

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE DOLLARS	UNIT PRICE CTS	BID AMOUNT DOLLARS	BID AMOUNT CTS
0760	908512 TEMPORARY GRASS SEEDING, WET GROUND	23600.000 SY				
0770	909004 TURBIDITY CURTAIN, FLOATING	1015.000 LF				
	SECTION 0001 TOTAL					
	TOTAL BID					

BREAKOUT SHEET INSTRUCTIONS

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

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

BREAKOUT SHEETS MAY BE SUBMITTED;

VIA E-MAIL TO: DOT-ASK@STATE.DE.US
SUBJECT: **T201330009.01** Breakout Sheet

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

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

BREAKOUT SHEET - 1 **CONTRACT NO. T201330009.01**
737523 - PLANTING

ITEM NO.	APPROX. QTY.	UOM	DESCRIPTION	UNIT PRICE	AMOUNT
1	4	EA	*Betula Nigra*, 3 In. Cal, B&b	$	$
2	5	EA	*Magnolia Virginiana*, 3 In. Cal, B&b	$	$
3	5	EA	*Platanus Occidentalis*, 3 In. Cal, B&b	$	$
4	12	EA	*Amelanchier Arborea*, No. 25 Container	$	$
5	24	EA	*Ilex Verticillata*, No. 20 Container	$	$
6	11	EA	*Viburnum Dentatum*, No. 25 Container	$	$

TOTAL ITEM 737523 - PLANTING $_____
(LUMP SUM BID PRICE FOR ITEM 737523)

BREAKOUT SHEET - 2 **CONTRACT NO. T201330009.01**

ITEM 746559 - Bridge Lighting and Power

ITEM NO.	APPROX. QTY.	UOM	DESCRIPTION	UNIT PRICE	AMOUNT
1	1,100	LF	#12 AWG Copper Wire Type XHHW	$	$
2	3,000	LF	#10 AWG Copper Wire Type XHHW	$	$
3	5,200	LF	#6 AWG Copper Wire	$	$
4	15,700	LF	#1/0 AWG Copper Wire Type XHHW	$	$
5	1	EA	50A Breaker for Installation in Existing Switchboard	$	$
6	14	EA	NEMA 4X Junction Box, 4" Square	$	$
7	1	EA	15 KVA Transformer 208/120V-480/277V	$	$
8	2	EA	2-Pole Lighting Contactor	$	$
9	1	EA	Hand-Off-Auto Control Switch	$	$
10	1	EA	Photocell	$	$
11	1540	LF	3/4" RGS Conduit	$	$
12	3574	LF	2" PVC Coated RMC	$	$
13	3555	LF	3" PVC Coated RMC	$	$
14	100	LF	3/4" Conduit (Indoors)	$	$
15	100	LF	1-1/4" Conduit (Indoors)	$	$
16	2	EA	100A Enclosed Circuit Breaker	$	$
17	1	EA	NEMA 4X Enclosure for 100A ECB	$	$
18	1	EA	Mini Power-Zone 15KVA Transformer & Distribution Panel	$	$
19	1	EA	GFCI Receptacle	$	$
20	1	EA	Weatherproof In-Use Cover, 1 gang	$	$
21	33	EA	LED Lighting Fixtures for Bridge - Type A	$	$
22	77	EA	LED Lighting Fixtures for Bridge - Type B	$	$

TOTAL ITEM 746559 - Bridge Lighting and Power $_____

(LUMP SUM BID PRICE FOR ITEM 746559)

"ATTENTION"

TO BIDDERS

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

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

BREAKOUT SHEETS MAY BE SUBMITTED;

VIA E-MAIL TO: DOT-ASK@STATE.DE.US
SUBJECT: **T201330009.01** Breakout Sheet

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

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

AFFIDAVIT
OF
EMPLOYEE DRUG TESTING PROGRAM

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors implement a program of mandatory drug testing for Employees who work on Large Public Works Contracts funded all or in part with public funds.

We hereby certify that we have in place or will implement during the entire term of the contract a Mandatory Drug Testing Program for our employees on the jobsite that complies with this regulation:

Contractor/Subcontractor Name: _____

Contractor/Subcontractor Address: _____

_____

_____

Authorized Representative (typed or printed):_____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____ day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED

CERTIFICATION

Contract No. T201330009.01
Federal Aid Project No. ESTP-N061(01)

The undersigned bidder, _____

whose address is _____

and telephone number is _____hereby certifies the following:

I/We have carefully examined the location of the proposed work, the proposed plans and specifications, and will be bound, upon award of this contract by the Department of Transportation, to execute in accordance with such award, a contract with necessary surety bond, of which contract this proposal and said plans and specifications shall be a part, to provide all necessary machinery, tools, labor and other means of construction, and to do all the work and to furnish all the materials necessary to perform and complete the said contract within the time and as required in accordance with the requirements of the Department of Transportation, and at the unit prices for the various items as listed on the preceding pages.

Bidder's Certification Statement [US DOT Suspension and Debarment Regulation (49 CFR 29)]:

NOTICE: All contractors who hold prime contracts (Federal Aid) with DelDOT are advised that the prime contractor and subcontractors are required to submit to DelDOT a signed and notary attested copy of the Bidder Certification Statement for each and every subcontract that will be utilized by the prime contractor. This Certification **must** be filed with DelDOT prior to written approval being granted for each and every subcontractor. Copies of the Certification Form are available from the appropriate District Construction Office.

Under penalty of perjury under the laws of the United States, that I/We, or any person associated therewith in the capacity of (owner, partner, director, officer, principal, investigator, project director, manager, auditor, or any position involving the administration federal funds):

a. am/are not currently under suspension, debarment, voluntary exclusion, or determination of ineligibility by any federal agency;
b. have not been suspended, debarred, voluntarily excluded or determined ineligible by any federal agency within the past 3 years;
c. do not have a proposed debarment pending; and,
d. have not been indicted, convicted, or had a civil judgement rendered against (it) by a court of competent jurisdiction in any matter involving fraud or official misconduct within the past 3 years.

Exceptions will not necessarily result in denial of award, but will be considered in determining bidder responsibility. For any exception noted, indicate below to whom it applies, initiating agency, and dates of action. Providing false information may result in criminal prosection or administrative sanctions.

_____

_____

_____

(Insert Exceptions)

DBE Program Assurance:

NOTICE: In accordance with 49 CFR Part 26 the undersigned, a legally authorized representative of the bidder listed below, must complete this assurance.

By its signature affixed hereto, assures the Department that it will attain DBE participation as indicated:

Disadvantaged Business Enterprise _____ percent (blank to be filled in by bidder)

The foregoing quantities are considered to be approximate only and are given as the basis for comparison of bids. The Department of Transportation may increase or decrease the amount of any item or portion of the work as may be deemed necessary or expedient. Any such increase or decrease in the quantity for any item will not be regarded as a sufficient ground for an increase or decrease in the unit prices, nor in the time allowed for the completion of the work, except as provided in the contract.

Accompanying this proposal is a surety bond or a security of the bidder assigned to the Department of Transportation, for at least ten (10) percentum of total amount of the proposal, which deposit is to be forfeited as liquidated damages in case this proposal is accepted, and the undersigned shall fail to execute a contract with necessary bond, when required, for the performance of said contract with the Department of Transportation, under the conditions of this proposal, within twenty (20) days after date of official notice of the award of the contract as provided in the requirement and specifications hereto attached; otherwise said deposit is to be returned to the undersigned.

I/We are licensed, or have initiated the license application as required by Section 2502, Chapter 25, Title 30, of the Delaware Code.

By submission of this proposal, each person signing on behalf of the bidder, certifies as to its own organization, under penalty of perjury, that to the best of each signer's knowledge and belief:

1. The prices in this proposal have been arrived at independently without collusion, consultation, communication, or Agreement with any other bidder or with any competitor for the purpose of restricting competition.
2. Unless required by law, the prices which have been quoted in this proposal have not been knowingly disclosed and will not knowingly be disclosed by the bidder, directly or indirectly, to any other bidder or competitor prior to the opening of proposals.
3. No attempt has been made or will be made by the bidder to induce any other person, partnership, or corporation to submit or not to submit a proposal for the purpose of restricting competition.

==========

I/We acknowledge receipt and incorporation of addenda to this proposal as follows:

No. Date No. Date No. Date No. Date No. Date

_____ _____ _____ _____ _____

BIDDERS MUST ACKNOWLEDGE RECEIPT OF ALL ADDENDA

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

==========

Sealed and dated this _____ day of _____ in the year of our Lord two thousand _____ (20___).

_____
Name of Bidder (Organization)

Corporate Seal

By: _____
Authorized Signature

Attest _____

_____
Title

SWORN TO AND SUBSCRIBED BEFORE ME this ___ day of _____, 20____.

Notary Seal

_____
Notary

BID BOND

TO ACCOMPANY PROPOSAL
(Not necessary if security is used)

KNOW ALL MEN BY THESE PRESENTS That:_____

of_____ in the County of _____and State of _____ as **Principal**, and _____ of _____ in the County of _____ and State of _____ as **Surety**, legally authorized to do business in the State of Delaware ("**State**"), are held and firmly unto the **State** in the sum of _____ _____Dollars ($_____), or _____ percent not to exceed _____ _____ Dollars ($_____) of amount of bid on Contract No. T201330009.01 , to be paid to the **State** for the use and benefit of its Department of Transportation ("**DelDOT**") for which payment well and truly to be made, we do bind ourselves, our and each of our heirs, executors, administrators, and successors, jointly and severally for and in the whole firmly by these presents.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH That if the above bounden **Principal** who has submitted to the **DelDOT** a certain proposal to enter into this contract for the furnishing of certain materiel and/or services within the **State**, shall be awarded this Contract, and if said **Principal** shall well and truly enter into and execute this Contract as may be required by the terms of this Contract and approved by the **DelDOT**, this Contract to be entered into within twenty days after the date of official notice of the award thereof in accordance with the terms of said proposal, then this obligation shall be void or else to be and remain in full force and virtue.

Sealed with _____ seal and dated this _____ day of _____ in the year of our Lord two thousand and _____(20___).

SEALED, AND DELIVERED IN THE
presence of

_____
Name of Bidder (Organization)

Corporate Seal

By: _____
Authorized Signature

Attest _____ _____
Title

_____
Name of **Surety**

Witness:_____ By: _____

_____
Title