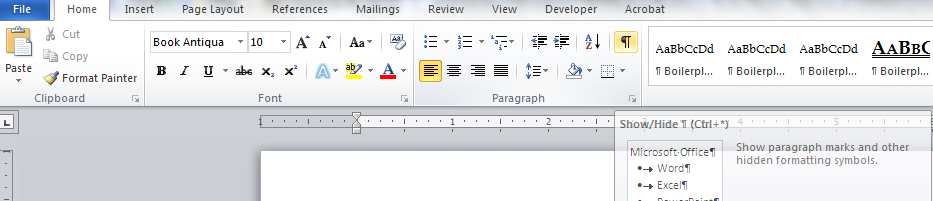
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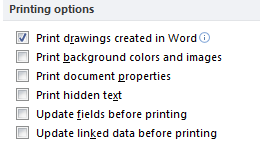
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\*\*LEAVE MARGIN AS IS ON ADVERTISEMENT TO ALLOW FOR LETTERHEAD\*\*

Advertisement for Proposals

(SELECT ROADWAY)

Contract No. [Insert Contract Number]

[Insert Contract Title]

Proposals are invited for Contract No. [Insert Contract number], which involves [insert brief description of Contract] from Milepost [insert number] to [insert number] in [insert location], New Jersey.

The principal items of work include:

[Principal items of work are those pay items that comprise a significant value of the portion of work or those that are integral to the main intent of the project. As a general rule of thumb, 20% of line items comprise 80% of the value of permanent work; some or all of these should be listed here as the principal items of work; do not include non-permanent items of work like mobilization nor traffic protection. Further note that this list only appears in the Advertisement of Proposals and is meant to give prospective bidders, their suppliers and subcontractors, and the general public a sense of the work being performed. The list should not be longer than 15 items; pay item descriptions may be combined if they are similar, e.g. those that apply to more than one location or structure.

Insert principal items of work as shown below:]

Asphalt Concrete Bridge Surfacing 5,700 Tons

Bidders must be prequalified under Contract Classification **[insert classification]**, Rating **[insert rating]**, up to $**[insert dollar amount]** Maximum prior to the receipt of Proposals. For Proposals submitted by joint ventures, each member of the joint venture must be prequalified in the Contract Classification, and the sum of the ratings held by each member must be within 10 percent of the total price bid by the joint venture. In cases where the sum of the ratings exceeds $50 million, the joint venture’s rating will be Unlimited.

Prequalification or renewal of prequalification must be received by the New Jersey Turnpike Authority’s (the “Authority”) Engineering Department no later than **[insert date]**. Prequalification documents are available on the Authority’s website (<https://www.njta.gov/business-hub/construction-maintenance/>) under the location entitled “Contractor Prequalification Requirements”. Prequalification documents may be obtained at the Contracts and Specifications Office or will be mailed to prospective Bidders upon request.

ELECTIONS TRANSPARENCY ACT, P.L. 2023, c. 30; FAIR AND OPEN EXCEPTION

In accordance with the Elections Transparency Act, P.L. 2023, c. 30 (the “Act”), effective January 1, 2023, all contracts awarded by the Authority pursuant to a fair and open process as defined in the Act are no longer subject to the political contributions proscription that prohibited a contract award if certain reportable contributions were solicited or made by a potential contract awardee. The Authority has determined that this procurement meets the requirements of a fair and open process and, accordingly, any such solicited or reportable contributions made by any bidder submitting a bid will not prohibit any contract award thereto if such bidder is deemed the lowest, responsible bidder.

PUBLIC WORKS CONTRACTOR REGISTRATION

Contractors shall comply with the Public Works Contractor Registration Act (“PWCRA”), as amended in, N.J.S.A. 34:11-56.48 et seq. All Bidders, including joint ventures, shall be registered pursuant to the PWCRA at the time of Proposal submission and are requested to submit a valid certificate of registration with their Proposals. A joint venture must have its own separate and distinct registration under the PWCRA at the time of bid submission. No Contractor or Subcontractor, including lower tier Subcontractors, shall engage in the performance of any public work subject to the Contract, unless the Contractor or Subcontractor is registered pursuant to the Act.

BUSINESS REGISTRATION ACT

Proof of valid business registration with the State of New Jersey Department of the Treasury, Division of Revenue and Enterprise Services, shall be submitted by the successful Bidder prior to award of the Contract in the form of a valid Business Registration Certificate in compliance with N.J.S.A. 52:32-44, as amended. No Contract shall be awarded without proof of business registration with the Division of Revenue and Enterprise Services.

SMALL BUSINESSES SET-ASIDE AND DISABLED VETERAN-OWNED BUSINESS REGISTRATION

In accordance with Executive Order No. 84 (Florio 1993) and Executive Order No. 71 (McGreevey 2003), it is the policy of the Authority that Small Business Enterprises (“SBEs”), as determined and defined by the State of New Jersey, Department of the Treasury, Division of Revenue & Enterprise Services (“Division”) in N.J.A.C. 17:13-1.1 et seq., have the opportunity to compete for and participate in the performance of Contracts for the purchase of goods and services and for construction services required by the Authority. The Authority further requires that its Contractors shall agree to take all necessary and responsible steps, in accordance with the aforementioned regulations, to ensure that SBEs have these opportunities.

The Contractor agrees to make a good faith effort to award at least 25% of this Contract to Subcontractors registered by the Division as an SBE firm. Subcontracting goals do not apply if the prime Contractor is a registered SBE firm.

In accordance with the New Jersey Set-Aside Act for Disabled Veterans’ Businesses, N.J.S.A. 52:32-31.1 et seq. (P.L. 2015, c. 116), it is the policy of the Authority that Disabled Veteran-Owned Businesses (“DVOBs”), as determined and defined by the State of New Jersey, Department of the Treasury, Division of Revenue and Enterprise Services in N.J.A.C. 17:14-1.1 et seq., have the opportunity to compete for and participate in the performance of contracts and subcontracts for construction services. The Authority further requires that its Contractors shall agree to take all necessary and responsible steps, in accordance with the aforementioned regulations, to ensure that DVOBs have these opportunities. The Contractor is encouraged to obtain a complete copy of the applicable regulations (N.J.A.C. 17:14 et seq.) prior to submitting bids to the Authority.

The Contractor agrees to make a good faith effort to award at least 3% of this Contract to Subcontractors registered by the Division as a DVOB firm. Subcontracting goals do not apply if the prime Contractor is a registered DVOB firm.

All Bidders must comply with the requirements of N.J.S.A. 10:5-31 et seq. and N.J.A.C. 17:27 et seq. relating to affirmative action rules prohibiting discrimination in employment and requiring affirmative action in performance of Contracts awarded to the successful Bidder.

ANNUAL REPORT OF CONTRIBUTIONS TO ELECTION LAW ENFORCEMENT COMMISSION

All business entities are advised of their responsibility to file an annual disclosure statement of political contributions with the New Jersey Election Law Enforcement Commission (ELEC) pursuant to N.J.S.A. 19:44A-20.27 if they receive contracts in excess of $50,000.00 from public entities in a calendar year. Business entities are responsible for determining if filing is necessary. Additional information on this requirement is available from ELEC at 888-313-3532 or at [www.elec.state.nj.us](http://www.elec.state.nj.us).

AFFIRMATIVE ACTION AND EQUAL EMPLOYMENT OPPORTUNITY

Bidders are required to comply with the requirements of N.J.S.A. 10:5-31 et seq. and N.J.A.C. 17:27 et seq.

INSTRUCTIONS TO BIDDERS

Proposals must be submitted electronically through the Bid Express Electronic Bidding portal on the Authority’s website (<https://www.njta.gov/business-hub/construction-maintenance/>) under the location entitled "Bid Express". Paper Proposals will not be accepted.

The deadline to submit Proposals is **[insert time)\*** o'clock Prevailing Time on the morning/afternoon of **[insert date]\*** at which time said Proposals will be downloaded by the Authority from the Electronic Bidding platform’s (BidX) website, publicly opened and read aloud at Authority headquarters and the results posted instantly at[https://bidx.com/njta/main](https://gcc02.safelinks.protection.outlook.com/?url=https%3A%2F%2Fbidx.com%2Fnjta%2Fmain&data=05%7C01%7Cdesposito%40njta.com%7C4874b7a3c7994f585e9c08dbafb6708e%7C5e8dc8606e2b4b27bc56b91bcddaf774%7C0%7C0%7C638296970332682084%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C3000%7C%7C%7C&sdata=aKT8%2BhXFq5MrhlokYWOMgSC0rEvxjqXm1gm4O4KudMY%3D&reserved=0).Any Addenda that may be issued will be issued at least three (3) business days prior to the deadline to submit Proposals as set forth above. Refer to Subsection 102.05 of the Specifications regarding the submission deadline for questions, interpretations or corrections.

The Bidders are advised that the Proposal Bond form provided in the Authority’s Electronic Bidding software must be executed by the Bidder.

All bid documents, except the 2016 Standard Specifications, may be examined or purchased online starting **[insert date]\*** at the Bid Express website, [www.bidx.com](http://www.bidx.com). Instructions may also be found through the Electronic Bidding link found on the Authority’s website (<https://www.bidx.com/njta/main>). The 2016 Standard Specifications, which form an integral part of the Contract, are available electronically on the Authority’s website (<https://www.njta.gov/2016-standard-specifications/>) and in print from the Authority at an additional cost of Forty Dollars ($40.00) per copy.

[Include the following, as requested by the Project Engineer, if the Contract is to include stipulations for a Pre-bid Presentation and/or Site Visit:]

Bidders are invited to attend a non-mandatory pre-bid presentation to be conducted by the Authority for the purpose of providing general information regarding the work involved under this Contract.

Prospective Bidders may register via e-mail to **[Authority’s Project Engineer]\*** by **[Time & Date]\*** at **[e-mail address]\***. The e-mail subject line should read, “Contract No. **[XXXX.XXX]** Pre-Bid Presentation”. Instructions related to the time of the presentation and other details regarding the presentation will be made available via e-mail by **[Date]\***. The presentation will be conducted on **[Date]\***.

Prospective Bidders may request to visit the site for their own familiarity prior to the proposal due date. All requests shall be via e-mail to **[Authority’s Project Engineer]\*** at **[e-mail address]\***. The e-mail subject line should read, “Contract No. **[XXXX.XXX]** Site Visit Request”.

The pre-bid site visit will be the only opportunity for the prospective Bidders to visit the site. During the pre-bid site visit a tour of the site will be conducted. No other site visits will be scheduled. Arrangements for the prospective Bidders to gain access to the site for the pre-bid site visit will be provided via e-mail to the prospective Bidders that register, as indicated above.

Nothing discussed or presented at the pre-bid site visit shall be considered part of the Contract. All requests for interpretation or correction must be submitted in accordance with Subsection 102.05.

NEW JERSEY TURNPIKE AUTHORITY

Daniel L. Hesslein, P.E.

Chief Engineer

\* INSERTED BY THE SPECIFICATIONS SECTION

Proposal Bond

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ as PRINCIPAL: and

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_as SURETY and duly qualified to transact business in the State of New Jersey, are hereby held and firmly bound unto the New Jersey Turnpike Authority in the sum of

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Dollars and

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Cents ($\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_) for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

Signed, this\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_day of\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_A.D. two thousand and\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

THE CONDITION OF THE ABOVE OBLIGATION IS SUCH that whereas the Principal has submitted to the New Jersey Turnpike Authority a certain Proposal, attached hereto and hereby made a part hereof, to enter into a Contract in writing for Contract No. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_of the New Jersey Turnpike Authority;

NOW, THEREFORE,

(a) If said Proposal shall be rejected by the New Jersey Turnpike Authority, or in the alternative,

(b) If said Proposal shall be accepted by the New Jersey Turnpike Authority, and the Principal shall duly execute the Contract Agreement and furnish the required Contract Bond, within the stipulated time,

Then this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall in no event, exceed the amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligation of said Surety and its bond shall be in no way impaired or affected by any extension of the time within which the Authority may accept such proposal; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

[Corporate Seal] \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

WITNESS OR ATTEST \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Principal

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

[Corporate Seal] \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

WITNESS OR ATTEST: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Surety

Contract Agreement

THIS AGREEMENT made this \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ day of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

in the year of our Lord, two thousand and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

between the New Jersey Turnpike Authority, party of the first part, sometimes

hereinafter called Authority, and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

party of the second part, sometimes hereinafter called Contractor.

WITNESSETH, that Said Contractor, in consideration of the payments hereinafter specified, hereby covenants and agrees to furnish and deliver all the materials, to do and perform all the work and labor required to be furnished and delivered, done and performed for, and to do and perform all things necessary or proper for, or incidental to the completion of Contract No.[insert number]in strict and entire conformity with the Specifications, attached hereto, and the Plans which consist of [insert number] drawings numbered [insert numbers] bearing the general title:

New Jersey Turnpike Authority

New Jersey Turnpike/Garden State Parkway [select roadway]

Contract No. [insert number]

[Insert Contract Title]

and other Contract Documents which are hereby made a part of this Agreement as fully and with the same effect as if the same had been set forth at length in the body of this Agreement.

All work under the Contract shall be performed and completed on or before [insert date].

If the Contractor fails to complete fully, entirely and in conformity with the provisions of the Contract, the Project and each and every part and appurtenance thereof, within the time stated above, or any portion for which a Completion Date is stipulated within such further time as may have been granted in accordance with the provisions of the Contract, then the Contractor shall and hereby agrees to pay the Authority for each and every calendar day that it is in default on time to complete the entire Project, [insert amount ($\_\_\_\_\_)] [Engineer to submit liquidated damages calculation with Phase C submission] which said amount per calendar day is agreed upon by the parties hereto to be liquidated damages and not a penalty.

The Contractor agrees to make payment of all proper charges for labor and materials required in the aforementioned work, and to defend, if so directed by the Authority, and to indemnify and save harmless the Authority, its officers, employees and agents against and from all damages and liabilities, threatened, pending or completed actions, proceedings or suits of every kind and all costs incurred in the defense, settlement or satisfaction thereof (including attorney's fees and court costs), including damages and liabilities, actions, proceedings, suits, costs, claims and judgments of officers, employees or agents of the Contractor and of its Subcontractors, and from all damages, liabilities, actions, proceedings, suits, costs, claims, or judgments to which the Authority or any of its officers, employees, or agents may be subjected by reason of injury to the person or property of others resulting from the performance of the Project; or the acts or omissions, whether negligent or not, of the Contractor, its officers, employees or agents, and of its Subcontractors; or of the Authority, its officers, employees and agents, or of third persons; or through any improper or defective machinery, implements or appliances used in the Project; and the Contractor shall further defend, if so directed by the Authority, indemnify and save harmless the Authority, its officers, employees and agents from all damages, liabilities, actions, proceedings, suits, costs or claims of any kind, which may be brought or instituted by any Subcontractor, material man or laborer who has performed work or furnished materials in or about the Project or by, or on account of, any claims or amount recovered for any infringement of patent, trademark or copyright. So much money due to the Contractor under and by virtue of the Contract as shall be considered necessary by the Authority may be retained by the Authority and held until such suits, proceedings, actions, claims or amounts shall have been settled, and suitable evidence to that effect furnished to the Authority. The obligations of this paragraph shall survive the expiration, termination or rescission of this Contract.

In consideration of these promises, the Authority hereby agrees to pay, as sole compensation for the performance of the Project, payments for the actual quantity of authorized work performed, as provided in the Specifications, at the prices for the Scheduled Items Of Work in the Proposal.

This Contract is to be binding upon the Authority, its successor or successors, and upon the Contractor and its heirs, executors, administrators, successor or successors, and is voidable and may be terminated by the Authority, in accordance with the Provisions of the Specifications, or if the provisions of the statutes relative thereto are not complied with.

Relevant records of private vendors or other persons entering into Contracts with covered entities are subject to audit or review by the New Jersey Office of the State Comptroller pursuant to N.J.S.A. 52:15C-14(d) and N.J.A.C. 19:70-2.2. The Contractor shall maintain all documentation related to products, transactions or services under this Contract for a period of five years from the date of final payment. Such records shall be made available to the New Jersey Office of the State Comptroller upon request.

In consideration of the Authority’s release of and permission to use any applicable computer-aided design and drafting (CADD) files for the development of shop drawings pertinent to this Contract, the Contractor shall defend, indemnify and save harmless the Authority, its officers, agents and employees and each and every one of them against and from all liabilities, judgments, threatened, pending or completed actions, suits, demands for damages or costs of every kind and description actually and reasonably incurred (including attorneys’ fees and costs and court costs) (collectively “Liabilities”) including, without implied limitations, Liabilities for any infringement of patent, trademark, trade secret or copyright (an “Intellectual Property Claim”) or Liabilities for damage to property or Liabilities for injury or death of any person (including Liabilities for damage to property or Liabilities for injury or death of the officers, agents and employees of either the Contractor or the Authority), resulting from the Contractor’s use of CADD files in the development of shop drawings for this Contract.

IN WITNESS WHEREOF, the parties hereto have duly executed this Agreement the day and year first above written.

Attest: New Jersey Turnpike Authority

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Secretary of the New Jersey Executive Director

Turnpike Authority

(Corporate Seal)

Witness or Attest:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Name of Contractor

(Corporate Seal) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_L.S.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_L.S.

Contract Bond

KNOW ALL MEN BY THESE PRESENTS:

That we,

(an individual, a partnership, a corporation)

duly organized under the Laws of the State of\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

and having a usual place of business at \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

as Principal, and

a corporation duly organized under the Laws of the State of and duly authorized to do business in the State of New Jersey and having a usual place of business at , as Surety, are holden and stand firmly bound and obligated unto the New Jersey Turnpike Authority, as Obligee, in the sum of lawful money of the United States of America, to and for the true payment whereof we bind ourselves and each of us, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

The condition of the above obligation is such that whereas, the above named Principal did on the \_\_\_\_\_\_\_ day of , 20 , enter into a Contract with the Obligee, New Jersey Turnpike Authority generally described as follows: which said Contract is made part of this Bond the same as though set forth herein.

Now, if the said Principal shall well and faithfully do and perform the things agreed by the Principal to be done and performed according to the terms of said Contract, and shall pay all lawful claims of laborers and other beneficiaries as defined by N.J.S.A. 2A:44-143 for labor performed or materials, provisions, provender of other supplies, or teams, fuels, oils, implements or machinery furnished, used or consumed in the carrying forward, performing or completing of said Contract, we agreeing and assentingthat this undertaking shall be for the benefit of laborers and any beneficiary as defined in N.J.S.A. 2A:44-143 having a just claim, as well as, for the Obligee herein, then this obligation shall be void; otherwise, the same shall remain in full force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall in no event exceed the penal amount of this obligation as herein stated.

The said Surety hereby stipulates and agrees that no modifications, omissions or additions in or to the terms of the said Contract or in or to the plans or specifications therefore shall in anywise affect the obligation of said Surety on its bond, and the Surety hereby waives notice of same.

IN WITNESS WHEREOF, we have hereunto set our hands and seals this day of in the year 20 .

WITNESS OR ATTEST:

[CORPORATE SEAL] PRINCIPAL

WITNESS OR ATTEST:

[CORPORATE SEAL] SURETY

Power of Execution

The undersigned, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(CORPORATION, PARTNERSHIP, OR INDIVIDUAL)

under the laws of the State of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_,

having principal office or registered agent in New Jersey at \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_,

(STREET)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, hereby nominates, constitutes and appoints \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(CITY) (PERSON)

with full power to act \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_,

(ALONE OR IN CONJUNCTION WITH ANOTHER PERSON)

on behalf of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(NAME OF COMPANY)

to make, execute, seal and deliver on its behalf as Contractor and as its act and deed, any and all Contracts, Change Orders, monthly and final payment certificates and other like instruments.

Such Contracts, Change Orders, monthly and final payment certificates and other like instruments shall be binding upon said company as fully and to all intents and purposes as if such instruments had been duly executed and acknowledged and delivered by the authorized officers of the company when duly executed, as indicated above, by either one of the aforementioned.

WITNESS OR ATTEST: NAME OF COMPANY

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ BY: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(SIGNATURE)

SIGNATURE OF AUTHORIZED PERSONS

TO ACT ON BEHALF OF ABOVE COMPANY

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(ADDRESS)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(DATE)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

CORPORATE SEAL:

Standard Specifications

The Standard Specifications of the New Jersey Turnpike Authority (Authority), Seventh Edition, dated 2016, copies of which are issued separately, as amended and augmented by the Supplementary Specifications, shall govern the construction of this Project and the execution of the Contract. The 2016 Standard Specifications are available electronically on the Authority’s Website (<https://www.njta.gov/2016-standard-specifications/>) and in print from the Authority at an additional cost of Forty Dollars ($40.00) per copy.

The attention of the Bidders is specifically directed to the provisions of such Standard Specifications, which are hereby made a part hereof, as if fully set forth at length herein.

The 2019 New Jersey Department of Transportation (NJDOT) Standard Specifications for Road and Bridge Construction, with updates through **[insert date]**, shall govern only the scheduled items of work for non-Authority roadways within this Contract where indicated by the following Authority Supplementary Specifications. For such scheduled items of work, the NJDOT QPL shall govern over the Authority QPL

The applicable portions of the NJDOT Standard Specifications are as follows:

[Include the following if scheduled items of work follow NJDOT Standard Specifications. NJDOT Special Provisions, if applicable, shall be placed before the Appendices as an Attachment A. Revise as necessary if another agency must be referenced. **If NJDOT Standard Specifications are not applicable to the contract, enter [NONE] below**:]

New Jersey Department of Transportation

Division 200 – Earthwork

Division 300 – Subbase and Base Course

Division 400 – Pavements

Division 500 – Bridges and Structures

Division 600 – Miscellaneous Construction

Division 700 – Electrical

Division 800 – Landscaping

Division 900 – Materials

Within Division 200 – 900 of the NJDOT Standard Specifications, all references to Subsection 105.05 Working Drawings shall be construed to mean Subsection 104.08 of the New Jersey Turnpike Authority Standard Specifications, as amended by these Supplementary Specifications.

[Follow these examples for referencing another agency’s Standards for a scheduled item of work:

208.01 Description.

“The item: Concrete Driveway, 6” Thick shall correspond to the NJDOT standard item number 606051P - Concrete Driveway, 6” Thick and it shall meet all specifications shown in the latest version of the NJDOT Standard Specifications for Road and Bridge Construction and any Special Provisions shown in Attachment A of these specifications.”

“The item: Concrete Driveway, 6” Thick designated on the Contract Plans will correspond to the latest version of the NJDOT Standard Roadway Construction Details CD-606-2 (CONCRETE AND HMA DRIVEWAY AND SIDEWALK).”

Supplementary Specifications

The following clauses represent modifications to the corresponding Subsections of the Standard Specifications and Sections and Subsections added to the Standard Specifications, all relating exclusively to the above Contract. Any applicable provision in the Standard Specifications not amended by and not in conflict with the Supplementary Specifications shall be understood to be in full effect.

[Include the following with federal-aid funded contracts:]

The following Federal-Aid Contract Provisions are also in full effect for this Contract and are included in Appendix [insert Appendix letter] of the Supplementary Specifications.

[List Provisions]

Note: With respect to the Federal-Aid Contract Provisions, insert the phrase "and New Jersey Turnpike Authority" after all references to the New Jersey Department of Transportation.

[Include the following as necessary, e.g. facilities contracts:]

Supplementary Specifications (Volume 2)

The Supplementary Specifications (Volume 2), which follow Construction Specification Institute's MasterFormat®, shall govern the construction of all building trades as defined therein. These specifications supplement and are in addition to the Standard Specifications of the New Jersey Turnpike Authority as augmented by the Supplementary Specifications. Any applicable provision in the Standard Specifications not amended by and not in conflict with the Supplementary Specifications (Volume 2) shall be understood to be in full effect.

Division 100 - General Provisions

Section 101 - General Information

[Include the following with all contracts:]

101.02 Definitions

(A) Abbreviations

Add the following to the list after the line for MARTCP:

MASH Manual for Assessing Safety Hardware

(B) Terms

Add the following to the table:

|  |  |
| --- | --- |
| Health and Safety Plan (HASP) | A written plan or plans that outline the safety management systems that will be used by the Contractor to control losses at their job sites. |
| New Jersey Turnpike Authority Health and Safety Plan (“NJTA-HASP”) Manual | Guidelines and minimum requirements for the development and implementation of the Contractor’s Health and Safety Plan. The NJTA-HASP Requirements are available on the Authority’s Web Site (<https://www.njta.com/doing-business/construction-and-maintenance-contracts>). Follow the link titled “NJTA Health and Safety Plan (HASP) Manual.” |
| Safety Representative (SR) | The term refers to the person hired by the Contractor to be responsible for the management of all the Contractor’s safety matters. The Safety Representative shall possess appropriate credentials as determined by the Authority and shall have successfully completed the 30-hour course given by OSHA in Construction Safety and Health. The Chief Engineer or its designee may accept other safety certifications or safety training in lieu of the above. |
| AASHTO Product Evaluation and Audit Solutions | A program administered by AASHTO that combines the professional and physical resources of the AASHTO member departments in order to evaluate materials, products, and devices of common interest for use in highway and bridge construction. The primary goal of the program is to provide cost-effective evaluations by eliminating duplication of testing and auditing by States and duplication of effort by manufacturers that provide products for evaluation. |

Delete “Preconstruction Conference” and replace it with the following:

|  |  |
| --- | --- |
| Pre-Construction Meeting | The initial Project meeting conducted by the Engineer, and attended by the Contractor. A separate utility pre-construction meeting may be scheduled. |

Delete “Letter of Surety”.

Delete “Proposal Guaranty” and replace it with the following:

|  |  |
| --- | --- |
| Proposal Guaranty | Security in the form of a Proposal Bond, accompanying a Proposal, guaranteeing that Bidder will execute the Contract and furnish the required Contract Bond, if Bidder’s Proposal is accepted. |

Section 102 - Bidding Requirements And Conditions

[Include the following with all contracts:]

102.04 Familiarity with Work

Add the following language to the end of this Subsection:

The Authority Standard Drawings are not included in the Contract Plans provided to plan holders. The Authority Standard Drawings are available at: [https://www.njta.gov/business-hub/professional-services/standard-drawings/.](https://www.njta.gov/business-hub/professional-services/standard-drawings/)

Standard NJDOT Construction Details are not included in the Contract Plan documents provided to plan holders. NJDOT Construction Details may be found at <https://www.state.nj.us/transportation/eng/CADD/v8/>.

The Reference Drawings as listed on the title sheet of the Plans will be available electronically (\*.pdf format) on the Authority’s Electronic Bidding or Secure FTP website. Instructions for accessing the Secure FTP website, if necessary, will be displayed on the Electronic Bidding website.

NOTE TO DESIGNERS:

If access to Reference Drawings and Reference Material is only to be made available to Eligible Plan Holders, as requested by the Project Engineer, then these files shall be appropriately identified in the “Phase D Final (Contracts Section Deliverable)” CD. These will be uploaded to the Secure FTP website, with access instructions provided on the Electronic Bidding website.

[Include the following, as requested by the Project Engineer, if Reference Material (e.g. Foundation Reports, Geotechnical Reports, Groundwater Monitoring Reports, etc.) will be made available electronically:]

The following Reference Material will be available electronically (\*.pdf format) on the Authority’s Electronic Bidding or Secure FTP website. Instructions for accessing the Secure FTP website, if necessary, will be displayed on the Electronic Bidding website:

[INSERT BULLETED LIST OF REFERENCE MATERIAL TITLES]

[Include the following if As-Built Reference Drawings for certain relevant contracts will not be listed on the Contract Plan Title Sheet. The list shall be as extensive as possible unless otherwise requested by the Project Engineer:]

The following list of Reference Drawings is not found on the title sheet of the Plans and is provided for assistance in identifying relevant Contract and Drawing Numbers. It is the responsibility of all prospective Bidders to utilize the information on these Reference Drawings in order to prepare a Contract bid.

|  |  |  |  |
| --- | --- | --- | --- |
| Location  (i.e., Str. No.) | Contract Name | Drawing Nos. | Contract Number |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

The Contractor shall review these Reference Drawings, which include information required for the prosecution of the contract work.

It is the Contractor’s sole responsibility to research, obtain, and review available documentation, within the Contracts and Drawings cited above. The Authority does not guarantee the accuracy of available as-built documentation.

The Contractor is advised that copies of relevant as-built drawings, as well as any and all field notes prepared by the Contractor are required to accompany all shop drawing submittals. Refer to Subsection 104.08, Shop and Working Drawings, for shop drawing submittals.

Information regarding a pre-bid site visit or presentation, if any, will be found in the Advertisement For Proposals.

102.07 Proposal Guaranty

Delete this Subsection and replace it with the following:

Proposals shall be accompanied by a Proposal Guaranty which shall consist of a Proposal Bond utilizing the forms provided in the Authority’s Electronic Bidding software.

The Proposal Bond shall be in the sum of not less than ten percent (10%) of the total price of the Proposal.

102.08 Power of Attorney and Consent of Surety

Delete this Subsection in its entirety and replace it with the following:

The Proposal Bond and the Consent of Surety shall be accompanied by a Power of Attorney evidencing the signatory’s authority to bind the Surety to the Proposal Bond and the Consent of Surety. The Power of Attorney shall expressly set forth the attorney-in-fact’s authority to sign the Proposal Bond and the Consent of Surety on behalf of the surety company, and shall further certify that such power is in full force and effect as of the date of the Proposal Bond and the Consent of Surety. The Consent of Surety shall set forth the surety company’s unqualified obligation to provide the Contract Bond upon award of the Contract to the Bidder. The Power of Attorney and Consent of Surety shall be in a form acceptable to the Authority.

102.09 Submitting Proposals

Delete this Subsection in its entirety and replace it with the following:

The Bidder shall submit a Proposal via Electronic Bidding. An authorized representative of the Bidder is required to digitally sign the Proposal. The Authority may reject Proposals that are not digitally signed by the authorized representative of the Bidder with a digital signature approved by the Electronic Bidding Platform and/or the Authority in accordance with the Electronic Bidding instructions during proposal submission. More information on digital signatures are found on the Authority’s Electronic Bidding website.

The Bidder is solely responsible for any and all errors and for timely submission of the bid, all components thereof, and all attachments thereto, through the Electronic Bidding system; the Authority assumes no responsibility for any claim arising from the failure of any Bidder or of the electronic delivery system to cause any bid, bid component, or attachment to not be delivered to the Authority on or before the time set for the opening of bids.

The following documents shall be submitted with the Proposal:

1. Scheduled Items of Work and associated bid prices.
2. Bidder’s Certification indicating the authorized representative of the firm who is submitting the Proposal.
3. Disclosure Statement indicating firm ownership in compliance with N.J.S.A. 52:25-24.2.
4. Non-Collusion Certification.
5. Prequalification Certification.
6. The Proposal Guaranty, Consent of Surety, and Power of Attorney.
7. Acknowledgment of Addenda, if issued.

Additionally, the Authority requests the following documents be submitted with the Proposal:

1. Set-Off for State Tax Form, pursuant to N.J.S.A. 54:49-20.
2. Certification of Business Registration as required pursuant to N.J.S.A. 52:32-44.
3. Valid Public Works Contractor Registration certificate(s) for the Bidder, and all joint venture entities if applicable, pursuant to the requirements of Subsection 102.15.
4. Certification of Non-Debarment form provided by the Authority, pursuant to N.J.S.A. 52:32-44.1.
5. Certification of Non-Involvement In Prohibited Activities in Russia or Belarus form provided by the Authority, pursuant to N.J.S.A. 52:32-60.1 et seq.
6. Disclosure of Investment Activities in Iran form provided by the Authority, pursuant to N.J.S.A. 52:32-58.

102.10 Withdrawing Proposal

Delete the second paragraph and replace it with the following:

Any Bidder attempting to withdraw a Proposal after the opening of bids for any reason, including an alleged unilateral mistake by the Bidder, may be subject to disqualification from submitting bids on Projects for a period not to exceed twelve (12) months, and on such terms as the Authority may determine.

102.11 Causes for Rejection

Delete the second paragraph and replace it with the following:

Proposals may be rejected in accordance with law, including, but not limited to, (a) if conditions, restrictions or limitations are attached to a Proposal, (b) if the Proposal fails to conform to the essential requirements of the Contract Documents, (c) if the bid amount is in excess of Bidder's prequalification classification, (d) if the Proposal Guaranty is not registered with one of the surety registry agencies listed in the Authority’s Electronic Bidding software by the proposal deadline, (e) if the unit prices are unbalanced, (f) if competition has been suppressed, (g) if received from Bidders who have previously performed work for the State of New Jersey or the Authority in an unsatisfactory manner, (h) for non-conformance with "The New Jersey Prevailing Wage Act," N.J.S.A.. 34:11-56.25 et seq. as amended and supplemented, (i) if more than one bid is submitted by the Bidder for the same contract, (j) if the bid is not submitted on the Authority’s issued Proposal form , (k) for nonconformance with New Jersey Public Works affirmative action requirements, N.J.S.A. 10:5-31 et seq. as amended and supplemented, (l) for nonconformance with New Jersey ownership disclosure requirements, N.J.S.A. 52:25-24.2 as amended and supplemented, (m) if it is deemed advisable to do so in the best interests of the Authority, (n) if the Bidder is disqualified pursuant to Subsection 102.02, (o) failure to be registered pursuant to the Public Works Contractor Registration Act (“PWCRA”) at the time of Proposal submission, (p) if the Proposal is unreasonable as to price, both as to Total Price and prices for individual line items as well, (q) if the Bidder is federally debarred pursuant to Subsection 102.22, (r) failure to submit a completed Disclosure of Investment Activities in Iran form pursuant to Subsection 102.18 prior to contract award or (s) for any other reason allowed by law.

Replace the third paragraph with the following:

The Authority reserves the right to waive any or all minor irregularities and technicalities in the submission of bidding documents, in accordance with law.

102.12 Return of Proposal Guaranty

Delete this Subsection and replace it with the following:

Proposal Guaranties of Bidders, whose bids are to be considered by the Authority, will be retained until such time as the Authority executes the Contract or when the matter has been disposed of by the Authority.

The Proposal Bond of Bidders, whose bids are not to be considered for Award by the Authority, will be void.

102.13 Prevailing Wage Rates

Add the following after the first paragraph:

In accordance with P.L. 2023, c. 138, effective August 16, 2024, the Contractor and all Subcontractors shall be registered with the New Jersey Wage Hub at https://njwages.nj.gov and shall electronically submit all certified wage records for work being performed on any public works contract with the Authority to the New Jersey Wage Hub. The Authority is registered with the New Jersey Wage Hub and has access to all such certified wage records through the New Jersey Wage Hub.

102.15 Public Works Contractor Registration Act

This Subsection is deleted in its entirety and replaced with the following:

Contractors shall comply with P.L. 1999, c.238, the Public Works Contractor Registration Act, as amended by P.L. 2003, c.91 (N.J.S.A. 34:11-56.48 et seq.), and shall have been issued a certificate of registration, by the New Jersey Department of Labor and Workforce Development, Division of Wage and Hour Compliance indicating compliance with the Act’s requirements prior to submission of their bid to the Authority. No Contractor or Subcontractor, including lower tier Subcontractors, shall engage in the performance of any public work subject to the Contract, unless they are registered pursuant to this Act.

The Authority requests that all Bidders, including joint ventures, submit a copy of their certificate of registration with the New Jersey Department of Labor and Workforce Development with their Proposal. A joint venture must have its own separate and distinct registration under the PWCRA at the time of bid submission. Instructions on submitting the certificate may be found on the Authority’s Electronic Bidding website. Copies of the certificates of registration for Subcontractors not listed in the Proposal shall be submitted in accordance with 103.04. The certificate(s), or certified facsimile(s) of the certificate, shall be maintained at the worksite and shall be made readily available for inspection.

102.16 Business Registration Act

Delete the second paragraph and replace it with the following:

Proof of valid business registration with the State of New Jersey Department of the Treasury, Division of Revenue and Enterprise Services, shall be submitted by the successful Bidder prior to award of the Contract in the form of a valid Business Registration Certificate in compliance with N.J.S.A. 52:32-44, as amended. No Contract shall be awarded without proof of business registration with the Division of Revenue and Enterprise Services. Any questions with regard to obtaining a BRC can be directed to the Division of Revenue and Enterprise Services by visiting their website at https://www.nj.gov/treasury/revenue/. Failure to comply with the requirements of N.J.S.A. 52:32-44 will result in penalties per N.J.S.A. 54:49-4.1.

102.17 Public Law 2005, Chapter 51 and (Executive Order 134) & Executive Order 117 Award of Contract

This Subsection is deleted in its entirety.

102.18 Disclosure of Investment Activities in Iran

This Subsection is deleted and replaced with the following:

Prior to contract award, pursuant to N.J.S.A. 52:32-58, the Bidder must certify that neither the Bidder, nor one of its parents, subsidiaries, and/or affiliates (as defined in N.J.S.A. 52:32-56(e)(3)), is listed on the Department of the Treasury’s List of Persons or Entities Engaging in Prohibited Investment Activities in Iran and that neither is involved in any of the investment activities set forth in N.J.S.A. 52:32-56(f). If the Bidder is unable to so certify, the Bidder shall provide a detailed and precise description of such activities to the Authority. The Bidder shall certify under penalty of perjury, date and return to the Authority the completed form entitled “Disclosure of Investment Activities in Iran” as set forth in the Proposal.

The Authority requires that all Bidders submit a copy of the form entitled “Disclosure of Investment Activities in Iran” prior to contract award. Instructions on submitting the form may be found on the Authority’s Electronic Bidding website.

The following Subsection heading is renamed:

102.19 Ethics Standards (Executive Order 189 (Kean))

Replace the bullets sequentially with letters (A) through (G).

Add the following Subsection:

102.20 Diane B. Allen Equal Pay Act

Pursuant to N.J.S.A. 34:11-56.14(b), any employer, regardless of the location of the employer, who enters into a Contract with a public body to perform any public work for the public body shall provide to the Commissioner of the New Jersey Department of Labor and Workforce Development, through certified payroll records required pursuant to P.L.1963, c.150 (N.J.S.A. 34:11-56.25 et seq.), information regarding the gender, race, job title, occupational category, and rate of total compensation of every employee of the employer employed in the State in connection with the Contract. The employer shall provide the Commissioner, throughout the duration of the Contract or Contracts, with an update to the information whenever payroll records are required to be submitted pursuant to P.L.1963, c.150 (N.J.S.A. 34:11-56.25 et seq.).

Information regarding the Diane B. Allen Equal Pay Act and its requirements may be obtained from the New Jersey Department of Labor and Workforce Development (LWD) web site at: <https://nj.gov/labor/equalpay/equalpay.html>

LWD forms may be obtained from the online web site at: <https://njwages.nj.gov/assets/NJWH_Contractor_User_Guide.pdf>

Add the following Subsection:

102.21 Prohibited Activities in Russia or Belarus

N.J.S.A. 52:32-60.1 et seq. (P.L. 2022, C.3) (the “Act”) states that prior to contract award, the awardee must certify that neither the awardee, nor any of its parents, subsidiaries, or affiliates engaged in prohibited activities in Russia or Belarus. However, the enforceability of N.J.S.A. 52:32-60.1 et seq. was challenged in the United States District Court for the District of New Jersey. On December 22, 2023, a company obtained a permanent injunction from the United States District Court, which enjoined the State from enforcing N.J.S.A. 52:32-60.1 on the ground that it would conflict with the existing federal sanctions regime and the United States Constitution’s Supremacy Clause.

N.J.S.A. 52:32-60.4 provides that the Act “shall not apply in circumstances when its application would violate federal law.” Accordingly, to enforce the Act in a manner consistent with the District Court’s decision and federal law, New Jersey deems its list of persons and entities engaging in prohibited activities in Russia or Belarus to consist of all persons and entities appearing on the list of Specially Designated Nationals and Blocked Persons promulgated by the United States Department of Treasury, Office of Foreign Assets Control (OFAC), on account of activity relating to Russia or Belarus. A searchable database of OFAC-listed persons and entities is available here: <https://sanctionssearch.ofac.treas.gov/>.

Consistent with the District Court’s decision, the State of New Jersey has revised its Certification of Non-Involvement In Prohibited Activities in Russia or Belarus form. Accordingly, prior to entering into the Contract, Bidders shall be required to complete and submit to the Authority the revised form entitled “Certification of Non-Involvement In Prohibited Activities in Russia or Belarus”.

Add the following Subsection:

102.22 Certification of Non-Debarment

Prior to the time a contract is awarded, pursuant to N.J.S.A. 52:32-44.1, the successful Bidder must certify that neither the successful Bidder, nor its affiliates are debarred at the federal level from contracting with a federal government agency. The Authority shall not make, negotiate, or award a contract to any successful Bidder that does not provide the above certification.

The Authority requests that all Bidders submit a copy of the form entitled “Certification of Non‐Debarment Form” with their Proposal. Instructions on submitting the form may be found on the Authority’s Electronic Bidding website.

In addition, all Bidders must register with the federal System for Award Management (SAM) prior to contract award. In order to comply with this requirement, Bidders must register in SAM at https://www.sam.gov and the Authority will verify the successful Bidder’s registration in SAM prior to contract award.

Add the following Subsection:

102.23 New Jersey Workplace Accountability in Labor List (WALL)

N.J.S.A. 34:1A-1.16 authorized the New Jersey Department of Labor and Workforce Development (NJDOL) to create a list on its website, dubbed the Workplace Accountability in Labor List (WALL), of any person found in violation of any State wage, benefit, and tax laws and against whom a final order has been issued by the NJDOL for such violation. Any person or business named on the WALL is prohibited from contracting with the Authority until that person or business has been removed from the WALL.

The WALL is found at https://www.nj.gov/labor/ea/osec/wall.shtml. [Include the following Section in every contract:]

Section 103 - Award and Execution of Contract

103.02 Execution of Contract

Add the following to the list of actions that shall be performed by the awarded Bidder within (10) calendar days of receipt of the Contract:

* Register to receive electronic ACH payment by following instructions in Exhibit M for Construction Contracts, found on the Authority’s website at <https://www.njta.gov/business-hub/construction-maintenance/> unless previously registered.

103.04 Subletting and Assigning Contract

Delete the second paragraph and replace it with the following:

The Contractor shall submit the "Notification of Intent to Subcontract" through the Manage Subcontractor Module in CapEx, a minimum thirty (30) days prior to said subcontractor mobilizing to the Project site. The notification shall include the name of all Subcontractors, a complete description and total value of each portion of the Work to be sublet. The notification shall also include a copy of a valid certificate of registration for the “Public Works Contractor Registration Act” for each subcontractor, including lower tier Subcontractors. Subcontractors not in possession of a valid copy of the certificate will be disapproved for Work. Subsequent notifications shall be promptly made by the Contractor during the performance of the Contract, advising the Engineer of any changes including additional subcontract work sublet by the Contractor.

Add the following after the first paragraph:

There are no specialty items in this Project.

[OR]

The specialty items under this Contract are:

* [List Specialty Items]

Section 104 - Control Of Work

[Include the following, in every Contract:]

104.01 Intent of Contract

Add the following before the first paragraph:

[Describe work to be done in general]

104.03 Plans and Specifications

The fourth paragraph is deleted and replaced with the following:

In case of conflicting requirements, the following order of precedence shall be adhered to:

1. Official approved drawings specially prepared for the Project
2. Supplementary Specifications
3. Qualified Products List
4. Traffic Manual
5. Standard Drawings
6. Standard Specifications

[Include the following with Contracts in which the bulleted material below is known or likely to exist:]

104.04 Change Orders

Paragraph (C) is deleted and replaced with the following:

1. The requirements of (A) and (B) of the Standard Specifications shall not apply to the following bid items:

* Disposal of Acid-Producing Soils
* Disposal of Regulated Material
* Disposal of Regulated Material, Hazardous

For each of these bid items, if changes result in a decrease of more than 25 percent of the quantity set forth in the Proposal, then the price bid for the item will be eligible for price negotiation. If changes in the quantity of these items result in an increase of more than 25 percent, then the price for the quantity of that item in excess of 125 percent of the proposal quantity shall be subject to negotiation.

In the event the Authority and the Contractor cannot reach a mutual agreement on price changes by negotiation, as provided in (A) and (B) of the Standard Specifications, and (C) above, payment for such work will, as directed by the Chief Engineer, be made on a force account basis, as prescribed in Subsection 108.04 or at the Contract’s original bid unit prices and the Change Order shall so state.

[Include the following as necessary:]

104.07 Cooperation by Contractor

Add the following language to the end of this Subsection: The Contractor is advised that other contracts with the[fill in Agency Name] for work on or adjacent to the Authority roadways may be in progress simultaneously with the work to be done under this Contract, either within, or adjacent to, the limits of this Contract. These contracts include, but are not necessarily limited to the following:

* [List Contracts by Contract No. and Title]

[Include the following as necessary:]

104.08 Shop and Working Drawings

Add the following after the first paragraph:

Shop and Working Drawings shall be submitted for the following items of work including but not limited to:

[Include the following if applicable:]

* Guide Rail, Type A
* Guide Rail, Type C
* Inlet, Type D2
* Lighting Standard Base, Type III
* Temporary Sheeting
* See Subsection 601.03(E) for a list of electrical items

[Include the following in any contracts requiring coordination with CONRAIL. Enter CONRAIL’s project manager contact information below:]

Per Section 804, shop drawings, procedures, and design calculations may be required by the railroad companies for work over their facilities and/or Right-Of-Way. The shop drawings should include, but not be limited to, site specific work plans for each proposed work location and work procedures as required. A railroad company submittal review period is typically thirty (30) days, the Contractor shall plan scheduled work accordingly.

Shop drawings, procedures, and design calculations required by the following railroad agencies for work over their facilities and Right-Of-Way shall be submitted as follows:

Consolidated Rail Corporation (CONRAIL)

330 Fellowship Road

3rd Floor

Mt. Laurel, NJ 08054

Attention:

Phone:

E-mail:

A minimum of five (5) sets of shop drawings are required for submission to each railroad agency unless otherwise specifically noted in the Appendices of these Specifications.

Prior to submitting the site-specific work plan to each railroad agency, the Contractor is required to obtain written approval of the work plan from the Engineer. This approval shall be included with the submissions to each agency.

The Contractor shall provide, to the Engineer at the pre-construction meeting, a copy of letters sent to the agencies noted above indicating a description of the work, procedures, time frame for performance, and requests for ROW access (permits, etc.). The letters shall detail the list of shop drawings that will be forwarded for review by these agencies.

[Replace the above directive for the first paragraph with the following for repainting Contracts:]

Add the following after the first paragraph:

Shop and working drawings shall be made for the following items of work including but not limited to:

1. Pollution collection and control plan (each structure)
2. Working platform plan (each structure)
3. Emergency management plan
4. Paint system samples, data sheets and specifications
5. Lead health and safety plan
6. Hazardous waste reclamation plan, storage and transport plan
7. Debris liners/tarps

[Replace the above directive for the first paragraph with the following for bridge deck repair Contracts:]

Add the following after the first paragraph:

Shop and working drawings shall be made for the following items of work including but not limited to:

* Catch Systems - Interior and Fascia
* Reinforcement Steel
* S-I-P Metal Forms
* Diaphragms
* Parapet and Safetywalk Support at Fascia Bay Deck Replacements
* Median Barrier Reconstruction - field measurements, demolition methods, formwork
* Precast concrete construction barrier
* Conduits, cables and wires
* Cables connector kits
* Grounding and termination devices
* Joint Reconstruction Type 1P, 1P Modified and F
* Pavement riser repair

[Include the following for all Contracts requiring work over waterways as necessary:]

104.09 Construction Layout

Add the following language after the sixth paragraph of this Subsection:

The navigable depths of the waterway outside the navigable channel is unknown. The Contractor shall, therefore, investigate by soundings or otherwise, the actual navigable depths of all locations where it plans to use barges or navigable equipment, to satisfy itself as of the navigable conditions in relation to its operations.

It will be the Contractor's responsibility to check all tide water levels to see if there are any excessive high or low tides. No extra payment will be made to the Contractor if the tide waters interfere with the Contractor's operations; however, such event may be the basis of an extension of time to do the work.

104.10 Mobilization

Delete the seventh paragraph and replace it with the following:

When 20 percent of the Work is completed, the lesser of the following will be paid: (a) 100 percent of the lump sum bid for mobilization, or (b) the value of the “Maximum Lump Sum Bid for Mobilization Item”, per the table in this Subsection.

[Include the following Subsections for all Contracts:]

104.11 Noise Control

1. Noise Level Schedule

In the Sound Level table on Page 100-32 of the Standard Specifications, replace “Week Days” with “Saturday”.

104.13 Sanitary, Health and Safety Provisions

Add the following language to the beginning of the Subsection:

The Contractor shall have [select one (shall have a Part-Time) or (shall have a Full-Time)] Safety Representative (SR) per the NJTA-HASP, Item 3.03(A). The Part-Time SR working hours shall be defined as ( ) hours per week.

[Note to Designer: The Authority Project Manager will provide guidance as to whether the Contract will require a Safety Representative and if it shall serve as on a Part-Time or Full-Time basis. The Project Manager will also indicate the number of hours required from the Part-Time Safety Representative.]

[Include the following for all Contracts requiring work over waterways as necessary:]

Add the following after the second paragraph:

No ground intrusive activities shall be performed by the Contractor in the **[fill in Areas]** without prior approval from the Engineer.

[Include the following Subsection for all contracts:]

104.14 Construction Safety

Add the following language to the beginning of this Subsection:

Contractors shall be required to ensure that all employees, Subcontractors and their suppliers, while on the job site and in conduct of Authority Contracts, comply with all provisions of the NJTA-HASP Requirements and any other Project specific Health and Safety Plan(s). The Contractor shall familiarize itself with the contents appropriate to its operations. The provisions of the Health and Safety Plans will be strictly enforced. Non-compliance with safety specifications will be treated in the same manner as non-compliance with any Contract item. Willful or repeated non-compliance could result in the shutdown of the job or the suspension of a portion thereof.

The NJTA-HASP Requirements and any other Project specific Health and Safety Plan(s) are supplementary documents to this law, and do not negate, abrogate, alter or otherwise change any provisions of OSHA, or any other applicable laws.

When other provisions in the Specifications conflict with provisions in the NJTA-HASP Requirements and any other Project specific Health and Safety Plan(s), the more stringent requirements, as determined by the Engineer, shall govern.

[Include the following subsection(s) for all Contracts requiring work over waterways as necessary:]

Add the following Subsection:

104.18 Transportation for Engineer

For the purpose of providing transportation for the Engineer, inspectors and other representatives of the Authority, to and from the shore between the various pier and timber fender repair sites, the Contractor shall provide the services of an approved power launch, complete with qualified operator.

The power launch shall be a minimum of twenty (20) feet long. The operator shall be an experienced operator familiar with waterways and work sites.

The launch shall be made available by the Contractor for the entire term of the Contract, from the time the Engineer requires inspection of the site prior to start of repair work to final inspection of repairs. The launch will be available for the Authority's use a maximum of 3 hours per day, the rest of the time the launch shall be available for Contractor's use for transporting personnel and equipment. In general, the launch will be required only during the normal working hours on Mondays through Fridays, excluding holidays; however, if for some reason it should be needed for work related to this Contract at other time periods, the Contractor will be given advance notice of such required use by the Engineer.

Docking facilities for the launch shall be provided by the Contractor in the vicinity of the bridge site.

The Contractor shall be responsible for operation of the launch and for any damage that may be caused by the launch, for maintaining the launch in good repair and operating condition, for providing all necessary fuel, safety equipment and other launch supplies and parts, and for paying for any permits, insurance premiums or fees that may be required in connection with the operation of the launch, for the entire period that the launch is required under this Contract.

No separate payment will be made for all costs incurred by the Contractor in providing the launch and operators as described above, including payment for any rental cost and insurance that may be necessary and allowances for depreciation, but all costs thereof shall be included in the Lump Sum price bid for the item [insert item name] scheduled in the Proposal.

Add the following Subsection:

104.19 Access to Working Sites

Authority roadways are not to be used to gain access to the working sites. The Contractor shall furnish necessary boats to transport its personnel, materials and equipment to the various bay and river piers where work is proposed to be performed.

Staging areas for the waterworks are not available on Authority right‑of‑way. Staging areas and access to these work areas are the responsibility of the Contractor.

Delivery of materials and other work required for the Project shall not interfere with Authority traffic or navigation in affected waterways.

[Include the following subsection for all Contracts requiring work in proximity to Newark Liberty International Airport:]

Add the following Subsection:

104.20 Coordination with Aircraft Operations

Due to the proximity of aircraft operations at Newark Liberty International Airport to the construction site, the Contractor is advised that it shall be required to coordinate its operations with the Airport Duty Manager at (973) 961-6025, as well as comply with the following restrictions when the use of any equipment exceeds 42 feet above ground:

1. Construction equipment shall:
2. Not exceed an elevation of 100 feet above ground.
3. Be obstruction marked in accordance with FAA Advisory Circular 70/7460-1E.
4. Be obstruction lighted when at or over 75 feet above ground. Obstruction lights shall be battery operated, and shall be similar and equal to McDermott Model No. UF-60-7-75.
5. Work shall be performed between the hours of 12 midnight and 6 a.m. or as directed by the Airport Duty Manager.
6. When not in use and at the end of each day's work, all construction equipment shall be lowered to their minimum heights.

The site of the work is in the vicinity of Newark Airport Facility. Prior to commencement of work in all areas where the Contractor's equipment might create an obstruction or hazard to air traffic, the Contractor shall be required to submit its proposed method to the Federal Aviation Agency with a copy sent to the Port Authority of New York and New Jersey indicating the types and maximum heights of equipment intended for use in that area.

Height restrictions on construction equipment are also caused by the proximity of runway glidepaths, since no equipment may work within operational glidepaths. Exact restrictions shall be obtained by the Contractor from the FAA. No additional compensation will be made if the Contractor is required to move equipment from a glide path that becomes operational due to changes in weather conditions or other restrictions imposed by the FAA.

Section 105 - Control of Materials

[Include the following with all Contracts:]

105.01 Materials

Add the following language before the first paragraph:

Contractor shall use products listed on the QPL and shall adhere to Subsection 105.11 for approved equals and substitutions.

105.07 Storage of Materials and Staging Areas

Add the following language after the fourth sentence of the first paragraph:

Storage/Staging areas for this Contract are [insert allowable staging areas, restrictions, and any work to be completed within the staging areas]. The Contractor shall be required to maintain areas in a clean and neat condition.

[Include the following in Contracts with Electrical or ITS items:]

Add the following language to the end of this Subsection:

The Contractor shall store all Electrical and ITS devices in accordance to manufacturer recommendations. The equipment listed below is required to be stored within a climate-controlled facility in accordance with manufacturer’s recommendations and specified storage temperature and humidity range for a maximum period of two months prior to installation and activation:

1. All equipment/devices containing batteries including, but not limited to, In-Pavement Wireless Sensors

2. Transformers

[Include the following Section with all Contracts:]

Section 106 - Legal Relations And Responsibility

106.02 Laws and Ordinances

Delete the fourth paragraph and replace with the following:

The parties to this Contract agree to incorporate into the Contract the mandatory language of N.J.A.C. 17:27-3.6, N.J.A.C. 17:27-3.8, and N.J.A.C. 17:27-7.4 promulgated by the Treasurer pursuant to P.L. 1975, c. 127, N.J.S.A. 10:5-31 et seq., and the Contractor or Subcontractor agrees to comply fully with these regulations.

See Appendix A in the Supplementary Specifications for Affirmative Action Mandatory Language.

106.10 Permits, Licenses and Taxes

Add the following language after the sixth paragraph of this Subsection:

Pursuant to N.J.S.A. 54:49-19, and notwithstanding any provision of the law to the contrary, whenever any taxpayer, partnership, or S corporation under Contract to provide goods or services or construction projects to the State of New Jersey or its agencies or instrumentalities, including the legislative and judicial branches of State government, is entitled to payment for those goods or services or construction projects and at the same time the taxpayer, or the partner or shareholder of that entity, is indebted for any State tax, the Director of the Division of Taxation shall seek to set-off that taxpayer’s, partner’s or shareholder’s share of the payment due to the taxpayer, partnership, or S corporation. The amount of set-off shall not allow for the deduction of any expenses or other deductions which might be attributable to a partner or shareholder subject to set-off under this act. No payment shall be made to the taxpayer, the provider of goods or services or the Contractor or Subcontractor of construction projects pending resolution of the indebtedness.

The Director of the Division of Taxation shall give notice of the set-off to the taxpayer, the provider of goods or services, or the Contractor or Subcontractor of construction projects and provide an opportunity for a hearing, upon thirty (30) days notice, under the procedures for protests established under N.J.S.A. 54:49-18. No requests for conference, protest or subsequent appeal to the Tax Court from any protest under this Subsection shall stay the collection of the indebtedness. Interest that may be payable by the State pursuant to P.L. 1987, c. 184 (N.J.S.A. 52:32-32 et seq.) to the taxpayer, the provider of goods or services, or the Contractor or Subcontractor of construction projects shall be stayed.

1. Dewatering Permit

Delete the second and third paragraphs.

106.18 Utilities

Add the following language to the end of this Subsection:

[Include the following in Contracts with Electrical or ITS items:]

1. Service Requests

New electrical service requests have been made as required. The following is a list of service requests and utility contact information.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Location | Electric Service Job Number and Status | Utility Company | Utility Contact Name | Utility Contact  Information |
| **(Provide description of location)** | **(Provide utility job number and Status such as “Approved”)** | **(Provide utility company name)** | **(Provide utility representative name)** | **(Provide utility representative contact information)** |

106.19 Risks Assumed by the Contractor

Replace the first paragraph with the following:

The Contractor assumes the following distinct and several risks, whether they arise from acts or omissions, and whether or not resulting from the negligence of the Contractor, its Subcontractors, suppliers, materialmen, employees, agents and all others working for the Contractor on the Project, or of the Authority, or of third persons, or from any other cause, and whether such risks are within or beyond the control of the Contractor, excepting only risks which arise from solely affirmative acts done by the Authority subsequent to the execution of the Contract including, but not by way of limitation, actual and willful intent to cause the loss, damage and injuries described in Paragraphs (A) through (C) below.

The Contractor shall indemnify and save harmless the Authority, and the Authority's agents, against all claims described in Paragraphs (B), (C), and (D) below, and for all expenses incurred by the Authority in the defense, settlement or satisfaction thereof, including expenses of attorneys. If so directed, the Contractor shall at its own expense defend against such claims, in which event it shall not without obtaining express advance permission from the Authority raise any defense involving in any way jurisdiction of the tribunal, immunity of the Authority, governmental nature of the Authority, or the provisions of any statutes respecting suits against the Authority.

The provisions of this Subsection shall also be for the benefit of all officers, agents, and employees of the Authority so that they shall have all the rights which they would have under this Subsection if they were named at each place above at which the Authority is named, including a direct right of action against the Contractor to enforce the foregoing indemnity, except, however, that the Authority may at any time in its sole discretion and without liability on its part cancel the benefit conferred on any of them by this Subsection.

Neither the acceptance of the Project by the Authority nor the making of final payment shall constitute a release of the Contractor from any liabilities arising under this Subsection. Moreover, neither the enumera­tion in this Subsection nor the enumeration elsewhere in the Contract of particular risks assumed by the Contractor or of particular claims for which it is responsible shall be deemed: (a) to limit the effect of the provisions of this Subsection or of any other provision of the Contract relating to such risks or claims, (b) to imply that it assumes or is responsible for risks or claims only of the type enumerated in this Subsection or in any other provision of this Contract, or (c) to limit the risks which it would assume or the claims for which it would be responsible in the absence of such enumerations.

The Contractor expressly understands and agrees that any insurance protection required by the Contract, or otherwise provided by the Contractor, shall in no way limit the Contractor's responsibility to defend, indemnify, and save harmless the Authority as herein provided. Such insurance requirements are designed to provide greater assurance to the Authority that the Contractor will be financially able to discharge its obligations under this Subsection and as to the risks assumed elsewhere in the Contract and shall not in any way be construed as a limitation on the nature and extent of such obligations.

Delete the last four paragraphs of this Subsection and replace with the following:

1. Risk of Americans with Disabilities Act Claims

The Contractor and the Authority do hereby further agree that the provisions of Title II of the Americans With Disabilities Act of 1990 (“the ADA") (42 U.S.C. §12101 et seq.), which prohibits discrimination on the basis of disability by public entities in all services, programs and activities provided or made available by public entities, and the rules and regulations promulgated pursuant thereunto, are made a part of this Contract. In providing any aid, benefit, or service on behalf of the Authority pursuant to this Contract, the Contractor agrees that the performance shall be in strict compliance with the ADA. In the event that the Contractor, its agents, servants, employees, or Subcontractors violate or are alleged to have violated the ADA during the performance of this Contract, the Contractor shall defend the Authority in any action or administrative proceeding commenced pursuant to this ADA. The Contractor shall indemnify, protect, and save harmless the Authority, its agents, servants, and employees from and against any and all suits, claims, losses demands, or damages, or whatever kind or nature arising out of or claimed to arise out of the alleged violation. The Contractor shall at its own expense, appear, defend, and pay any and all charges for legal services and any and all costs and other expenses arising from such action or administrative proceeding or incurred in connection therewith. In any and all complaints brought pursuant to the Authority grievance procedure, the Contractor agrees to abide by any decision of the Authority which is rendered pursuant to said grievance procedure. If any action or administrative proceeding results in an award of damages against the Authority or if the Authority incurs any expense to cure a violation of the ADA which has been brought pursuant to its grievance procedure, the Contractor shall satisfy and discharge the same at its own expense.

The Authority shall, as soon as practicable after a claim has been made against it, give written notice thereof to the Contractor along with full and complete particulars of the claim. If any action or administrative proceedings is brought against the Authority or any of its agents, servants, and employees, the Authority shall expeditiously forward or have forwarded to the Contractor every demand, complaint, notice, summons, pleading, or other process received by the Authority or its representatives. It is expressly agreed and understood that any approval by the Authority of the services provided by the Contractor pursuant to this Contact will not relieve the Contractor of the obligation to comply with the ADA and to defend, indemnify, protect, and save harmless the Authority pursuant to this paragraph. It is further agreed and understood that the Authority assumes no obligation to indemnify or save harmless the Contractor, its agents, servants, employees and Subcontractors for any claim which may arise out of their performance of this Contract. Furthermore, the Contractor expressly understands and agrees that the provisions of this indemnification clause shall in no way limit the Contractor's obligations assumed in this Contract, nor shall they be construed to relieve the Contractor from any liability, nor preclude the Authority from taking any other actions available to it under any other provisions of the Contract or otherwise at law.

106.20 Insurance

1. Commercial General Liability Insurance

Delete the first sentence and replace it with the following:

Contractor shall maintain Commercial General liability insurance (CGL) with a primary coverage limit of not less than $2,000,000 each occurrence.

1. Commercial Automobile Liability Insurance

Delete the first sentence and replace it with the following:

Contractor shall maintain Commercial Automobile liability insurance covering all vehicles owned or used by Contractor with a primary coverage limit of not less than $2,000,000 each occurrence.

1. Contractors Pollution Liability Insurance

Delete the first sentence and replace it with the following:

Contractor shall maintain Contractors Pollution liability (CPL) insurance with a primary coverage limit of not less than $5,000,000 each occurrence, $10,000,000 aggregate.

1. Umbrella Excess Liability Insurance

Delete the first sentence and replace it with the following:

For Contracts with an original Award value less than or equal to $100,000,000.00, Contractor shall maintain Umbrella Excess liability insurance with a coverage limit of not less than $3,000,000.

For Contracts with an original Award value over $100,000,000.00, Contractor shall maintain Umbrella Excess liability insurance with a coverage limit of not less than $8,000,000.

1. Railroad Insurance

Add the following:

[Designer to include reference to respective railroad agency insurance requirements whether to an added Appendix or website link]

[Include the following in any Contracts requiring coordination with CONRAIL:]

Contractor shall adhere to the requirements of the latest “Conrail Insurance Specifications” found at https://conrail.com/safety/working-on-conrail-property/

1. Insurance, Certificate, and Endorsement Requirements

Delete Part (3)(e) and replace it with the following:

All certificates shall be submitted through the Authority’s Project Management System, CapEx Manager.

[NOTE TO DESIGNER: Include the following if directed by the Authority’s Law Department. Revise the first sentence only if directed:]

The following paragraph is added:

1. Builder’s Risk / Installation Floater Insurance

The Contractor shall provide Builders Risk/Installation Floater Insurance with a coverage limit of not less than the contract amount. Such insurance shall be written on the latest ISO form without any added restrictions or diminution in coverage (or a substitute form providing at least equivalent coverage) and shall cover all risks of physical loss or damage to the work performed, including collapse, flood and earth movement. The interests of the New Jersey Turnpike Authority, its contractors and subcontractors, as their interest may appear, in all real and personal property owned, used or intended for use or hereafter created, installed or acquired, including while in the course of building, erection, installation and assembly shall be covered. This insurance shall be endorsed to apply as primary insurance and not contribute with any other insurance or self-insurance programs afforded to the Authority. This insurance shall be endorsed to waive the insurance carrier’s right of subrogation against the New Jersey Turnpike Authority and its members, commissioners, officers, agents, employees, guests, consultants and volunteers.

[Include the following in any Contracts requiring coordination with railroad agencies:]

[NOTE TO DESIGNER: Railroad Insurance and Permit requirements shall be inserted and referenced via appendices.]

106.24 Small Business Enterprise Program

[Include the following with all Contracts:]

Delete the first sentence of the first paragraph and replace it with the following:

In accordance with Executive Order No. 84 signed by Governor Jim Florio on March 5. 1993 and Executive Order No. 71 signed by Governor James E. McGreevey on October 2, 2003, it is the policy of the New Jersey Turnpike Authority (the “Authority”) that Small Business Enterprises (“SBE”), as determined and defined by the State of New Jersey, Department of Treasury, Division of Revenue and Enterprise Services (“Division”) and the Department of the Treasury (“Treasury”) in N.J.A.C. 17:13-1.1 et seq. have the opportunity to compete for and participate in the performance of contracts for the purchase of goods and services and for construction services required by the Authority.

Delete the fourth and fifth paragraphs and replace it with the following:

The Contractor is required to complete and submit, within 7 days after Notice of Award, the Authority form entitled “SBE/DVOB Participation Schedule”, which is included on the Authority’s website. The form must identify the Contractor’s compliance with the Authority’s SBE goals for this Project.

In the event that the Bidder cannot meet the above mentioned SBE participation goals set for this Contract, Authority Form entitled “SBE/DVOB Unavailability Certification”, which is included on the Authority’s website, must also be completed and submitted. The Bidder must demonstrate to the Authority’s satisfaction that a genuine good faith effort has been made to meet this percentage.

In the first sentence of the seventh paragraph, delete “N.J.A.C. 17:14-5.2” and replace it with “N.J.A.C 17:13-4.2”.

Delete the eighth paragraph and replace it with the following:

If the Contractor, for any reason, at any time during the course of the Contract, intends to make any additions, deletions or substitutions to the list of firms on the “SBE/DVOB Participation Schedule” form submitted to the Authority, the Contractor shall notify the Authority in writing of such proposed changes and shall submit a revised “SBE/DVOB Participation Schedule” form from the Authority’s website to the Authority for each such proposed change. Any such proposed changes must comply with the requirements and procedures set forth in Appendix X.

[Note to the Designer – Replace 106.24 with the following if this is an Immediate Repair contract:

Delete Subsection 106.24 in its entirety. There are no Small Business Enterprise Program requirements for this Contract.]

The following Subsection is being added:

106.27 Disabled Veteran-Owned Business Program

In accordance with the New Jersey Set-Aside Act for Disabled Veterans’ Businesses, N.J.S.A. 52:32-31.1 et seq. (P.L. 2015, c. 116), it is the policy of the Authority that Disabled Veteran-Owned Businesses (“DVOBs”), as determined and defined by the State of New Jersey, Department of the Treasury, Division of Revenue and Enterprise Services in N.J.A.C. 17:14, have the opportunity to compete for and participate in the performance of contracts and subcontracts for construction services. The Contractor shall agree to take all necessary and responsible steps, in accordance with the aforementioned regulations, to ensure that DVOBs have these opportunities.

The Contractor shall agree to make a good faith effort to award at least 3% of this Contract to Subcontractors registered by the Division as a DVOB firm. Subcontracting goals do not apply if the prime Contractor is a registered DVOB firm.

The Contractor shall comply with all requirements described in Appendix V

Section 107 ‑ Prosecution And Progress

Delete Subsection 107.02 in its entirety and replace it with the following:

[Include the following with all Contracts:]

107.02 Pre-Construction Meeting

Prior to the issuance of the Notice to Proceed and/or commencement of work, a Pre-Construction Meeting will be held in the offices of the Authority to discuss the scope of the work, schedule, role of Engineer, Contractor’s organization, drawings, cross-sections, Standard Specifications, Supplementary Specifications, insurance, partial payments, construction layout, progress photos, maintenance bond security, existing conditions, methods for maintaining and protecting traffic during construction, materials to be ordered, testing of materials, equipment to be used, and all essential matters pertaining to the prosecution of and the satisfactory completion of the Project as required.

The Contractor, its superintendent, or its authorized agent shall be present at the meeting and shall present a list of proposed Subcontractors (if any), an executed application for a Traffic Permit to begin work at the site, two (2) copies of the Health and Safety Plan (HASP) and Safe Work Plans (SWP) that comply with the NJTA-HASP and requirements of a satisfactory HASP and SWP as set forth elsewhere in the Contract Documents, and other data as required by the Authority. The information so presented shall be on forms submitted to the Contractor with the notice of this Pre-Construction Meeting. Separate safety kickoff meeting, utility meeting, pre-concrete, pre-paving meetings, and/or other meetings may be scheduled when required by these Supplementary Specifications, or as needed.

[Include the following with all Contracts:]

107.03 Commencement of Work

Delete the first paragraph and replace it with the following:

Upon execution of the Contract by the Authority, a fully executed copy thereof together with a Notice To Proceed will be forwarded to the Contractor. Receipt of the executed Contract and Notice shall constitute the Contractor's authority to enter upon the site of the work, provided the Contractor has prior thereto submitted to the Engineer, and it has accepted, the insurance certificates required under Subsection 106.20 and applied for and received a Traffic Permit required under Section 801. Construction operations shall not begin until the Contractor has supplied, and the Engineer has accepted, the HASP and SWP, the progress schedule and other certifications, forms, schedules, and any other documents required by the Contract Documents prior to the beginning of construction operations and established a field office as required by the Supplementary Specifications. Furthermore, no construction operations shall begin until the safety kickoff meeting has been held and the Contractor has satisfied all requirements thereto.

[Include the following with all Contracts:]

107.04 Progress Schedule

Delete the third paragraph and replace it with the following:

A progress schedule submission is defined as the complete progress schedule described above, as well as subsequent updated progress schedules described under Part 107.04(E)(1)(e).

The Engineer will not process a “Certificate for Payment to Contractor” until the progress schedule submission has been approved. Ten (10) working days will be required for review and comment on each progress schedule submission for Projects having a duration of two (2) years or less with two (2) additional working days for each year or part thereof in excess of two (2) years. Once the progress schedule has been approved by the Engineer, the Contractor shall not deviate from the logic, interim milestones or Contract Completion Date contained therein without the approval of the Engineer in writing.

107.10 Progress Photographs

[Include the following with Contracts which do not require progress photographs:]

Delete this Subsection in its entirety.

[Include the following with all Contracts which do require progress photographs:]

Delete this Subsection in its entirety and replace it with the following:

Before construction operations have started at the site, Contractor shall take and provide color photographs in a number that is sufficient to depict the existing condition of the construction site. A minimum of ten (10) views shall be taken each month to show the progress of work and shall continue until completion of work. The Engineer will determine the actual number and location of views to be taken each month. A complete set of digital image electronic files shall be submitted to the Engineer, without charge to the Authority, promptly after taking the views each month.

The digital files shall be:

* JPEG file format
* Minimum resolution 4032 x 3024 (equivalent to 12 megapixels)
* Identified with the Contract Number, date, and location in the filename

All photographs taken of the construction area shall not be released to any source whatsoever without the prior written permission from the Authority. This provision shall prevail for the duration of the Contract and shall run indefinitely thereafter.

107.11 Lane and Roadway Occupancy Charges

Delete the second paragraph and replace it with the following:

The Authority’s Road User Cost Manual and Lane Occupancy Charge Worksheet are available on the Authority’s website [(https://www.njta.com/doing-business/professional-services](https://www.njta.gov/business-hub/construction-maintenance/)).

[Use the following for Contracts that include lane closings. The Lane Occupancy Charges shall be calculated in accordance with the Authority’s Road User Cost Manual and Lane Occupancy Charge Worksheet:]

Add the following language after the second paragraph:

The Lane Occupancy Charges for lane closings in this Contract are shown in the table below, and they will be assessed after the expiration of the permissible lane closing periods specified in the Authority’s Manual for Traffic Control in Work Zones, until such time as the lane is fully available for use by Authority patrons or Authority Maintenance crews, as applicable, for each location of work in this Contract.

[Insert the table and accompanying note(s) from the Lane Occupancy Charge Worksheet used to calculate the Lane Occupancy Charges for lane closings in this Contract from the Authority’s Road User Cost Manual. Revise the example table and notes shown below, as necessary:]

|  |  |
| --- | --- |
| Reopening Of Lane Is Late By: | Lane Occupancy Charge Assessed: |
| 1 to 15 minutes | $500 |
| 16 to 30 minutes | $700 |
| 31 to 45 minutes | $1,000 |
| 46 to 60 minutes | $1,300 |
| 61 to 75 minutes | $2,400 |
| 76 to 90 minutes | $4,600 |
| 91 to 105 minutes | $7,800 |
| 106 to 120 minutes | $12,800 |

Notes:

Every 15 minutes late after 2 hours is an additional charge of $5,000 to a maximum total daily charge of $20,000.

Note that the charges above will not be added together. The Lane Occupancy Charge to be assessed is the single value in the right-hand column corresponding to the lateness of work zone pick up found in the left-hand column.

Section 108 – Measurement and Payment

108.01 Measurement of Quantities

Include the following in all contracts except those that do not have Plans.

The following language is added to the end of this Subsection:

The complete identity and description of each Pay Item included in the Contract will appear in the Plans on the sheet titled “Estimate of Quantities.”

Add the following Subsection:

[Note: Include the following with all Contracts that include any of the pay items in Table 108-1]

108.10 Fuel Price Adjustment

The Authority will make periodic price adjustments for fuel usage for Items listed in Table 108-1. Each month will be divided into two periods. Period one includes the first day of the month through the fourteenth day of the month. Period two includes the fifteenth day of the month through the last day of the month. Work starting within period one and continuing past midnight of the fourteenth day into the fifteenth day of the month will be included in period one for any price adjustments. Work continuing past midnight of the last day of the month into the first day of the next month will be included in period two.

The Authority will calculate fuel price adjustments based on the pay quantities of listed Items using the fuel usage factors listed in Table 108-1.

Price adjustments may result in an increased payment to the Contractor for increases in the price index and may result in a reduction in payment for decreases in the price index.

If the as-built quantity of a Pay Item listed in Table 108-1 differs from the sum of the quantities in the partial payment as defined in Subsection 108.03, and the as-built quantity cannot be readily distributed among the months that the Pay Item listed in Table 108-1 was constructed, then the Authority will determine fuel price adjustment by distributing the difference in the same proportion as the Pay Item’s partial payment quantity is to the total of the Pay Item’s time period estimates.

[NOTE TO DESIGNER: Designer shall develop a list of Contract items for the table below with a

fuel usage factor based on the below listed items. Only show applicable pay items from specific Contract.]

|  |  |
| --- | --- |
| **Table 108-1 Fuel Price Adjustment** | |
| **Items** | **Fuel Usage Factor** |
| **Roadway Excavation, \_\_\_\_\_** | **.5 Gallons per Cubic Yard** |
| **Disposal of Acid Producing Soils** | **.5 Gallons per Cubic Yard** |
| **Disposal of Regulated Material** | **.5 Gallons per Cubic Yard** |
| **Disposal of Regulated Material, Hazardous** | **.5 Gallons per Cubic Yard** |
| **Removal of Concrete Pavement** | **.25 Gallons per Square Yard** |
| **Embankment, \_\_\_\_\_** | **1.0 Gallons per Cubic Yard** |
| **Foundation Excavation** | **.5 Gallons per Cubic Yard** |
| **Subbase** | **1.0 Gallons per Cubic Yard** |
| **Aggregate Base Course,\_\_\_\_\_ Thick** | **0.30 Gallons per Square Yard** |
| **Hot Mix Asphalt Surface Course** | **2.50 Gallons per Ton** |
| **Hot Mix Asphalt Intermediate Course** | **2.50 Gallons per Ton** |
| **Hot Mix Asphalt Base Course** | **2.50 Gallons per Ton** |
| **Hot Mix Asphalt Bridge Surfacing** | **2.50 Gallons per Ton** |
| **Bridge Approach Slab** | **0.25 Gallons per Square Yard** |
| **Portland Cement Concrete Pavement, \_\_\_\_\_\_\_\_" Thick** | **0.25 Gallons per Square Yard** |
| **Toll Plaza Slab** | **0.25 Gallons per Square Yard** |
| **Pavement Removal, \_\_\_\_\_\_\_\_" Depth** | **0.25 Gallons per Square Yard** |
| **Surface Milling, 2" Average Depth** | **0.25 Gallons per Square Yard** |
| **Open-Graded Friction Course** | **2.50 Gallons per Ton** |
| **Soil Aggregate Base Course, Variable Thickness** | **1.0 Gallons per Cubic Yard** |
| **Soil Aggregate Base Course, 6" Thick** | **.30 Gallons per Square Yard** |
| **Concrete In Culvert** | **1.0 Gallons per Cubic Yard** |
| **Concrete in Structures, Toe Wall** | **1.0 Gallons per Cubic Yard** |
| **Concrete in Structures, Apron Slab** | **1.0 Gallons per Cubic Yard** |
| **Concrete In Pylon Wall** | **1.0 Gallons per Cubic Yard** |
| **Concrete In Structures, Headwalls** | **1.0 Gallons per Cubic Yard** |
| **Concrete In Substructure Above Footings** | **1.0 Gallons per Cubic Yard** |
| **Concrete In Footings** | **1.0 Gallons per Cubic Yard** |
| **Concrete In Backwall** | **1.0 Gallons per Cubic Yard** |
| **Concrete in Abutments Above Footings** | **1.0 Gallons per Cubic Yard** |
| **Concrete in Coping** | **1.0 Gallons per Cubic Yard** |
| **Concrete in Piers Above Footings** | **1.0 Gallons per Cubic Yard** |
| **Concrete in Retaining Walls Above Footings** | **1.0 Gallons per Cubic Yard** |
| **Concrete in Sidewalk and Bridge Parapet Class A** | **1.0 Gallons per Cubic Yard** |
| **Concrete In Bridge Parapet** | **1.0 Gallons per Cubic Yard** |
| **Concrete in Superstructure, HPC** | **1.0 Gallons per Cubic Yard** |
| **Concrete In Deck Slabs** | **1.0 Gallons per Cubic Yard** |
| **Concrete in Superstructure** | **1.0 Gallons per Cubic Yard** |
| **Concrete in Sidewalk** | **1.0 Gallons per Cubic Yard** |
| **Concrete In Safetywalk** | **1.0 Gallons per Cubic Yard** |
| **Concrete In Median Curb** | **1.0 Gallons per Cubic Yard** |
| **Concrete in Deck Slabs, HPC** | **1.0 Gallons per Cubic Yard** |
| **Concrete in Headblock, HPC** | **1.0 Gallons per Cubic Yard** |
| **Concrete in Parapet, HPC** | **1.0 Gallons per Cubic Yard** |
| **Bridge Approach Slab, HPC** | **1.0 Gallons per Cubic Yard** |
| **Concrete in Deck, HPC** | **1.0 Gallons per Cubic Yard** |
| **Retaining Wall (Mechanically Stabilized Earth OR Prefabricated Modular Walls)** | **.10 Gallons per Square Foot** |
| **Ground Mounted Noise Barrier Panel** | **.10 Gallons per Square Foot** |
| **Bridge Mounted Noise Barrier Panel** | **.10 Gallons per Square Foot** |
| **Retaining Wall Mounted Noise Barrier Panel** | **.10 Gallons per Square Foot** |
| **Micro-milling Deck Surface** | **.25 Gallons per Square Yard** |

If a Pay Item has a unit of measure which differs from that listed in Table 108-1, the Authority will apply an appropriate conversion factor to determine the number of gallons of fuel used.

The Authority will calculate fuel price adjustment using the following formula:

F = (MF – BF) \* G

Where:

F = Fuel Price Adjustment

MF = Fuel Price Index for work performed in the time-period immediately before the partial payment cutoff date

BF = Basic Fuel Price Index

G = Gallons of Fuel for Price Adjustment

The Authority will use the [fuel price index](http://www.state.nj.us/transportation/business/trnsport/PriceIndex.shtm) posted every month from the New Jersey Department of Transportation’s website, <https://www.state.nj.us/transportation/business/aashtoware/PriceIndex.shtm>.

The Basic Fuel Price Index is the index which is listed for the month prior to the receipt of bids. If the month prior to the receipt of bids has two indices, the index in effect for the first day of that month will govern for the Basic Fuel Price Index. If the Fuel Price Index increases by 50 percent or more over the Basic Fuel Price Index, do not perform any work involving Items listed in Table 108-1 without written approval from the Engineer.

Fuel price adjustment will be on a lump sum basis, and an estimated amount to cover the fuel price adjustment will be included in the Proposal. Payments for increases will be made from this amount.

Payment will be made under:

***PAY ITEM PAY UNIT***

Fuel Price Adjustment (No-Bid) USD

Pay Items not listed within Table 108-1 will not be subject to the “Fuel Price Adjustment”.

Add the following Subsection:

108.11 Steel Price Adjustment

The Authority will make a steel price adjustment for Items listed in Table 108-2 using the price index indicated for the Pay Item. This adjustment is based solely on the mill-provided steel.

The Contractor may opt out of a steel price adjustment for one or more of the categories of structural steel, reinforcement steel, or piles, shown in Table 108-2, by providing the Engineer with a list of those categories to which the Contractor does not want to apply the steel price adjustment. Provide the list within 5 business days following the preconstruction meeting. Ensure the list identifies all items in each opt out category by pay item number, unit code, and pay item description. Only entire categories will be considered. Only the items listed will be excluded for a price adjustment. Failure to submit the list within the specified time will result in losing the opportunity to opt out of the steel price adjustment. The steel price adjustment will always apply to beam guide rail, rub rail, and sign structures.[NOTE TO DESIGNER: Contract must contain 1,000,000 pounds (or 500,000 pounds for contracts with a 3 year or greater duration from award to completion) or a combination of the below Pay Items except that BEAM GUIDE RAIL, RUB RAIL, OVERHEAD SIGN STUCTURE and CANTILEVER SIGN STRUCTURE will always be included without meeting the pound requirement. Remove Pay Items that do not qualify.

[NOTE TO DESIGNER: Contract must contain 1,000,000 pounds (or 500,000 pounds for contracts with a 3 year or greater duration from award to completion) or a combination of the below Pay Items except that BEAM GUIDE RAIL, RUB RAIL, OVERHEAD SIGN STUCTURE and CANTILEVER SIGN STRUCTURE will always be included without meeting the pound requirement. Remove Pay Items that do not qualify.]

|  |  |  |
| --- | --- | --- |
| **Table 108-2 Steel Price Adjustment** | | |
| **Pay Item** | **Price Index (BS & MS)** | **Cost Basis (CB) $/Lb** |
| Structural Steel | US Dept. of Labor, Bureau of Labor Statistics - Producer Price Index for Semifinished Steel Mill Products WPU 101702 |  |
| Reinforcement Steel | US Dept. of Labor, Bureau of Labor Statistics - Producer Price Index for Semifinished Steel Mill Products WPU 101704 |  |
| Reinforcement Steel, Epoxy-Coated | US Dept. of Labor, Bureau of Labor Statistics - Producer Price Index for Semifinished Steel Mill Products WPU 101704 |  |
| Reinforcement Steel, Galvanized | US Dept. of Labor, Bureau of Labor Statistics - Producer Price Index for Semifinished Steel Mill Products WPU 101704 |  |
| Reinforcement Steel, Stainless Steel | US Dept. of Labor, Bureau of Labor Statistics - Producer Price Index for Semifinished Steel Mill Products WPU 101704 |  |
| Furnishing Steel Piles | US Dept. of Labor, Bureau of Labor Statistics - Producer Price Index for Hot Rolled Steel Bars, Plates and Structural ShapesWPU 101702 |  |
| Beam Guide Rail | US Dept. of Labor, Bureau of Labor Statistics - Producer Price Index for Semifinished Steel Mill Products WPU 101702 |  |
| Rub Rail | US Dept. of Labor, Bureau of Labor Statistics - Producer Price Index for Semifinished Steel Mill Products WPU 101702 |  |
| Overhead Span Sign Support Structure \_\_\_ | US Dept. of Labor, Bureau of Labor Statistics - Producer Price Index for Semifinished Steel Mill Products WPU 101702 |  |
| Overhead Cantilever Sign Support Structure \_\_\_ | US Dept. of Labor, Bureau of Labor Statistics - Producer Price Index for Semifinished Steel Mill Products WPU 101702 |  |
|  |  |  |

For a noted price index, the Authority will use the final published price index and will not use preliminary price information.

Price adjustments may result in an increased payment to the Contractor for increases in the price index and may result in a reduction in payment for decreases in the price index.

When the Monthly Steel Price Index is greater than the Benchmark Steel Index, the Authority will calculate Steel Price Adjustment using the following formula:

**S = [(BS-MS)+(BSx0.10)]/(-BS) x CB x W**

When the Monthly Steel Price Index is less than the Benchmark Steel Price Index, the Authority will calculate Steel Price Adjustment using the following formula:

**S = [(MS-BS)+(BSx0.10)]/(BS) x CB x W**

|  |  |
| --- | --- |
|  | Where: |
|  | S = Steel Price Adjustment (Dollars)  BS = Benchmark Steel Price Index – the preliminary steel price index for the month before the project is bid |
|  | MS = Monthly Steel Price Index - the steel price index for the month steel is shipped from the mill |
|  | CB = Cost Basis ($/Lb) Determined from the New Jersey Department of Transportation’s website. |
|  | W = Weight of Steel ( Lb) |

The New Jersey Department of Transportation will post the Monthly Steel Price Index every month on their website.

A price adjustment will only be made for price increases when **(MS-BS)/BS > 10%**, and a price adjustment will only be made for price decreases when **(BS-MS)/BS > 10%**.

With each delivery of steel, submit to the Engineer documentation from the fabricator or supplier which details the following information:

1. Weight of the steel shipped from the mill to the fabricator or supplier
2. Date of the shipment
3. Item description and Item number(s) for which the steel is associated.

If the documented steel weight is for more than one Pay Item, provide the Engineer with the weight attributed to each Pay Item.

Provide the documentation to the Engineer within 60 days from the date of the shipment. The Authority will not make a price adjustment for steel shipped before the bid date.

The Authority will make a price adjustment for the Pay Item “Structural Steel” based on the weights listed in Table 108-3. If the steel for an Item is shipped on dates having different monthly index prices, the Authority will proportionately adjust the weight used in the calculation of the price adjustment by multiplying the weight shipped by the ratio of the weight for the Pay Item listed in Table 108-3 to the sum total of weight shipped for that Pay Item. If the weight of steel estimated for a structure in Table 108-3 differs from the actual weight by more than 10%, the Authority will make a price adjustment based on the actual weight.

|  |  |  |
| --- | --- | --- |
| **Table 108-3 STRUCTURAL STEEL** | | |
| **Structure** | **Item No.** | **Weight (Lb)** |
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The Authority will make a price adjustment for the Pay Items Overhead Span Sign Support Structure and Overhead Cantilever Sign Support Structure based on the weights listed in Table 108-4. If the steel for an Item is shipped on dates having different monthly index prices, the Authority will proportionately adjust the weight used in the calculation of the price adjustment by multiplying the weight shipped by the ratio of the weight for the Item listed in Table 108-4 to the sum total of weight shipped for that Item. If the weight of steel estimated for a structure in Table 108-4 differs from the actual weight by more than 10%, the Authority will make a price adjustment based on the actual weight.

|  |  |  |
| --- | --- | --- |
| **Table 108-4** | | |
| **Overhead and Cantilever Sign Structure Number** | **Item No.** | **Weight (Lb)** |
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|  |  |  |
|  |  |  |

The Authority will make a price adjustment for reinforcement steel only for steel provided in association with the Reinforcement Steel Pay Items. The Authority will make a price adjustment for reinforcement steel based on the weight of reinforcement indicated in the Proposal for a Pay Item as adjusted by Change Orders. If the steel for a Pay Item is shipped on dates having different monthly index prices, the Authority will proportionately adjust the weight used in the calculation of the price adjustment by multiplying the weight shipped by the ratio of the weight for the Pay Item to the sum total of weight shipped for that Pay Item.

The Authority will make a price adjustment for piles based on the weight of steel furnished for pipe piles and for steel H-piles based on the Engineer’s order list. The weight of steel furnished for piles will not include the weight for ancillary materials such as pile shoes, and splice collars.

The Authority will make a price adjustment for Beam Guide Rail (including posts) and Rub Rail based on the weight of steel furnished. The weight will not include coating. The weight does not include associated hardware and the weight of end treatments.

If the preliminary monthly steel price index increases 100% or more over the Benchmark Steel Price Index, do not order more steel without written approval from the Engineer. The Engineer will determine if work will continue based on the Steel Price Index increase.

There will be no increase to Steel Price Adjustment if the work is behind schedule by fault of the Contractor.

Payment will be made under:

***PAY ITEM PAY UNIT***

Steel Price Adjustment (No-Bid) USD

Pay Items not listed within Table 108-2 will not be subject to the “Steel Price Adjustment”.

Section 109– Acceptance and Guaranty

[Include the following with all Contracts:]

109.01 Final Cleaning Up

Delete this Subsection in its entirety and replace it with the following:

The Engineer will be notified forty-five (45) days prior to the closing of the staging area, and the Engineer will subsequently notify the Authority’s Environmental Section. Before the final acceptance of the Project, the Contractor shall remove all equipment, temporary work, hazardous materials, unused and useless materials, rubbish and temporary buildings, shall repair or replace in an acceptable manner fences or other private or public property which may have been damaged or destroyed on account of the prosecution of the work, shall fill all depressions and water pockets on public and private property caused by its operations, shall remove all obstructions from waterways caused by its work, shall clean all drains and ditches within and adjacent to the site of the Project which have been obstructed by its operations, and shall leave the site of the Project and adjacent public and private property in a neat and presentable condition wherever its operations have disturbed conditions existing at the time of starting work. If an above ground storage tank containing fuel was used, the Contractor shall provide soil sample testing results from the surrounding area following the removal of the tank. Payment for final cleaning up and restoration of property as above provided will not be made under any specific item, but the cost of this work shall be included in the prices bid for the various items scheduled in the Proposal.

109.03 Maintenance Bond

[Add the following with landscaping Contracts:]

Replace the first sentence of the first paragraph with the following:

Before final payment is made as provided in Subsection 108.05, the Contractor shall furnish a Surety Bond to the Authority in a sum equal to twenty‑five (25) percent of the final Contract Price.

[Add the following with federal-aid funded Contracts:]

Add the following:

Payment will be made under:

***PAY ITEM PAY UNIT***

Maintenance Bond Lump Sum

Payment for Maintenance Bond shall include all costs associated with furnishing a maintenance bond as stipulated under this subsection.

Division 200 - Earthwork

Section 201 - Clearing and Grubbing

201.04 Measurement

[Include the following when clearing and grubbing is not a pay item:]

Delete this Subsection and replace it with the following:

Clearing and Grubbing will not be measured, but the cost thereof shall be considered incidental to all other items.

Section 202 - Roadway Excavation

NOTE TO DESIGNER:

For Contracts that include Overload Removal, the cross sections should show the previously placed surcharge as the existing ground, without any settlement, and the following note should be adjacent to the Earthwork Summary on the Plans:

“The estimated quantity for Overload Removal is based upon the design cross sections for Contract No. [previous surcharge Contract] Embankment and Grading, minus [insert number] percent to allow for the probable subsidence of the land under the previously placed embankments. Overload Removal will be measured and paid for as stipulated in Section 202 of the Supplementary Specifications."

Section 208 – Temporary Soil Erosion And Dust Control

208.01 Description

Add the following:

A field meeting with the Authority maintenance district having jurisdiction shall be held prior to the placement of soil stabilization matting.

208.02 Materials

Add the following:

Straw Blanketing 919.35(C)

Biodegradable Polypropylene Mat 919.35 (D)

208.03 Method of Construction

The following is removed and replaced:

1. Soil Stabilization Matting

Soil Stabilization Matting shall be placed at locations designated by the Engineer.

208.05 Payment

Delete the fourth paragraph and replace with the following:

Payment for soil stabilization matting will be made in accordance with Section 706.

Section 213 – Regulated Material

213.03 Methods of Construction

Add the following:

Restoration of soil erosion will be made in accordance with Section 208.

Section 214 – Vibration and Displacement Monitoring

NOTE TO DESIGNER:

Designer shall be responsible for determining when and where vibration and displacement monitoring is necessary in a Project and for determining the condition of the features to be monitored and for verifying/modifying the recommended settlement and deformation limits notes in Section 214.03(C)2. These criteria shall be clearly shown in the Contract Plans and explicitly revised in this specification as required. Final vibration and displacement limits shall be set by the Contractor’s specialty consultant as approved by the Engineer, but the Designer shall be responsible for determining Threshold Values for occupied or critical structures such as hospitals, laboratories, museums, monuments, etc., which may require more frequent monitoring and more stringent Threshold and Limiting Values where vibration may be disruptive to the operation of the monitored Feature or where annoyance to residents is anticipated. These Threshold Values shall be coordinated with both the Authority and the owner/operator of the monitored Feature in the design phase of the Project.

Add the following Section:

Section 216 – Contaminated Soil and Groundwater Management

216.01 Description

It is essential that any contaminated soil or groundwater encountered during the Project be handled in a manner that is protective of human health, safety, and the environment.

This Section describes procedures for the management of regulated material (contaminated or potentially contaminated soil and/or groundwater) that may be encountered throughout the Project area. The work shall include the excavation, handling, stockpiling, sampling, analysis, and the ultimate disposal or reuse of contaminated soil, if encountered. The work shall also include the dewatering, treatment, sampling, analysis, and the ultimate disposal of contaminated groundwater, if encountered.

216.02 Site Background

[Include a description of the site background with all Contracts that include handling of potentially contaminated soil or groundwater. Where site background research and pre-construction sampling information exists, provide an explanation of type and concentrations of contamination identified in the background research and reference any reports (such as an Environmental Screening Report) that have been included in the specifications, which document environmental conditions. List the Environmental Screening Report under Subsection 102.04.]

[Include description here.]

[Include the following with all Contracts.]

216.03 Regulatory Requirements

The Contractor shall comply with all Federal, State, and local codes, standards, ordinances, guidance, and permits, including, but not limited to, the following:

USDOL OSHA 29 CFR 1910 General Industry

USDOL OSHA 29 CFR 1926 Safety and Health Regulations for Construction  
USDOT 49 CFR 171-180 and amendments

Surface Water Quality Standards (N.J.A.C. 7:9B)

Ground Water Quality Standards (N.J.A.C. 7:9C)

New Jersey Pollutant Discharge Elimination System (NJPDES) Rules (N.J.A.C. 7:14A)

Solid Waste Regulations (N.J.A.C. 7:26)

The Contractor shall comply with the following if the work involves handling of contaminated media:

Administrative Requirements for the Remediation of Contaminated Sites (N.J.A.C. 7:26C)

Remediation Standards (N.J.A.C. 7:26D)

Technical Requirements for Site Remediation (N.J.A.C. 7:26E)

NJDEP - Field Sampling Procedures Manual (August 2005)

NJDEP - Historic Fill Material Technical Guidance (April 2013)

NJDEP - Linear Construction Technical Guidance (January 2012)

NJDEP - Fill Material Guidance on SRP Sites (October 2021)

[Include the following with all Contracts. Provide an assessment of whether 24-hour or 40-hour HAZWOPER training is necessary, as per 29 CFR 1910.120(e)(3)]

216.04 Health and Safety Plan

This Project shall be conducted under the requirements of Occupational Safety and Health Administration (OSHA) Standards 29 CFR 1910 and 29 CFR 1926. The Contractor shall prepare a Site-Specific Health and Safety Plan in accordance with Section 216.03 of the specification. If contamination is documented to exist, the Health and Safety Plan shall include exposure risk.

[Enter the appropriate training hours below based on these OSHA regulations (current as of August 7, 2020):

1910.120(e)(3)(i)

General site workers (such as equipment operators, general laborers and supervisory personnel) engaged in hazardous substance removal or other activities which expose or potentially expose workers to hazardous substances and health hazards shall receive a minimum of 40 hours of instruction off the site, and a minimum of three days actual field experience under the direct supervision of a trained experienced supervisor.

1910.120(e)(3)(ii)

Workers on site only occasionally for a specific limited task (such as, but not limited to, ground water monitoring, land surveying, or geophysical surveying) and who are unlikely to be exposed over permissible exposure limits and published exposure limits shall receive a minimum of 24 hours of instruction off the site, and the minimum of one day actual field experience under the direct supervision of a trained, experienced supervisor.]

The Contractor shall provide the initial [choose one based on OSHA rules 29 CFR 1910.120(e)(3): 24-hour or 40-hour] training and annual training and medical monitoring for all Contractor employees scheduled to work in or with regulated material as specified in OSHA 29 CFR 1910.

216.05 Materials Handling Plan

If contaminated soil and/or groundwater will be handled during construction, the Contractor shall prepare a Materials Handling Plan (MHP), which shall include the following information:

* Reuse of Contaminated Soil
* Stockpiling/Staging Requirements and Procedures
* Waste Characterization
* Off-Site Disposal and Transportation
* Waste Disposal Documentation
* Backfilling and Capping
* Decontamination Procedure

[If addressing groundwater, include as applicable:]

* Contaminated Groundwater Management Procedures
* Emergency Response Procedures

A description of the MHP components is provided in the following paragraphs. The MHP shall be submitted as a draft for review by the Engineer. The MHP will incorporate all comments and then be finalized for approval.

1. [Include the following for all Contracts that include handling of contaminated soil]
2. Contaminated Soil Management Procedures

Excavated materials from the Project will generally be reused where generated, or characterized and disposed at a licensed disposal/recycling facility.

[Include the following language pertaining to reusing contaminated soil as backfill material for linear construction Projects.]

[If reusing soil, insert as applicable:]

Excavated contaminated soil can be reused on site as backfill material[If applicable: within the linear construction corridor], preferably in the same parcel from which it was excavated, except when it contains free and/or residual product. Excavated soils will be inspected by the Engineer for visual evidence of free and/or residual product for instances where soil will be reused as backfill material on site. Soil containing free and/or residual product must be disposed at an off-site licensed disposal/recycling facility.

[Include the following for all Contracts that include handling of contaminated soil]

1. Stockpiling/Staging Requirements and Procedures

If the contaminated soil is to be stockpiled, the Contractor shall coordinate with the Engineer to determine the best option for the temporary stockpiling/staging of materials. The Contractor shall obtain approval from the Engineer prior to moving contaminated soil within the site (away from the immediate work location) for fill/disposal/storage.

All proposed stockpile locations (temporary or longer-term) for contaminated material shall be identified on a site plan and presented to the Engineer for approval two weeks in advance of stockpiling activities. In the event that materials requiring off-site transportation are generated that have not been fully characterized for waste disposal, the Contractor shall coordinate with the Engineer to determine the best options for the temporary storage of this material. Once a designated staging area is approved by the Engineer, these soils shall be stockpiled in accordance with the following minimum handling criteria:

* Excavation, material handling and stockpiling shall be performed in a manner that minimizes the mixing of materials containing different levels and types of contamination in accordance with N.J.A.C. 7:26E-5.2(b).
* No re-handling of soils in designated, temporary stockpile storage areas shall be carried out without the approval and presence of the Engineer. No material shall be removed without suitable segregation, stockpiling, sampling, testing and characterization and completion of a bill of lading and/or hazardous or non-hazardous waste manifest.
* The transfer of all materials from excavation(s) to the designated staging area shall be conducted in such a manner as to not allow the spread of contaminated materials. Transfer of contaminated soils shall be performed in accordance with all applicable waste transportation and management requirements. At a minimum, all soils transported by truck shall be covered to minimize fugitive dust.

Stockpiled contaminated materials shall be placed on an impervious surface lined with polyethylene sheeting (with a minimum thickness of 20 mils) within the designated temporary stockpile storage areas. Excavated material shall be stockpiled. The stockpile will be securely covered with polyethylene sheeting at the end of each work day and maintained throughout the stockpile period to prevent wind dispersion and contact with precipitation. If dust suppression becomes necessary during the soil stockpiling, at the discretion of the Engineer, exposed soils shall be wetted.

If any petroleum contaminated soil is encountered, the soil shall be removed from the excavation to the extent practical and necessary to complete the proposed work. The petroleum contaminated soil shall be stockpiled separate from other soil.

All material entering or leaving the staging area shall be under the direct supervision of the Contractor. Stockpiles shall be inspected by the Contractor at a minimum of once each week and after every storm event. Inspection results will be recorded in a Daily Log to be maintained at the site and available for inspection by the Engineer or designee. A copy of the inspection log will be provided to the Engineer with other weekly submittals.

Stockpile areas will be graded to shed water such that storm water runoff is diverted from stockpiled materials and hay bale berms/silt fencing will be placed around the perimeter of the area. Hay bales will be used as needed near catch basins, surface waters and other discharge points. Stockpile slopes will be no steeper than 1 horizontal to 1 vertical (1:1).

Soil movement on site will be recorded on a Daily Soil Tracking Log to record all incoming and outgoing material for the duration of disposal activities. The log will include up-to-date records that identify the origin of each waste stream in the staging area; indicate the date the materials were received; list the specific storage location; indicate the date the materials were transported from the storage area to the final destination; and the location of the final destination.

[Include the following for all Contracts that include off-site disposal of contaminated soil as determined by soil quality data that exceeds the most stringent NJDEP Soil Remediation Standards.]

216.06 Waste Characterization

1. Waste Characterization

For off-site disposal purposes, the Contractor is responsible for collecting representative samples of the contaminated soil and submitting the samples to a New Jersey State certified laboratory for analysis. The Contractor shall sample and analyze material in strict accordance with the most recent versions of the NJDEP Field Sampling Procedures Manual. The disposal facility will dictate the waste characterization analytical parameters and sampling frequency.

The Contractor shall determine the process for waste characterization. If the Contractor decides to sample soil in areas designated for removal prior to excavation, the Contractor shall provide a sampling and analysis plan for in-situ waste characterization that meets the licensed disposal/recycling facility requirements. If the Contractor decides to stockpile the soil prior to disposal, the Contractor shall provide a sampling and analysis plan for stockpiled soil waste characterization that meets the licensed disposal/recycling facility requirements. The selection between in-situ and stockpile waste characterization may be dictated by the ability to stockpile the soil within the Project area pending disposal.

The results of the waste characterization analysis will determine whether the contaminated soil is hazardous or non-hazardous (i.e., ID-27) waste.

[Include the following for all Contracts that include off-site disposal of contaminated soil, whether hazardous or non-hazardous]

1. Off-Site Disposal and Transportation

Prior to disposal activities, the Contractor shall ensure that all operations associated with disposal/recycling of materials are in compliance with applicable Federal and New Jersey Department of Transportation regulations, as well as all applicable local requirements. The transporters of solid or hazardous waste shall hold an A-901 license for the collection or disposal of solid or hazardous waste and a Certificate of Public Convenience and Necessity (CPCN) for solid waste, pursuant to NJSA 13:1E-126 et seq. and NJSA 48:13A-1 et seq.

The Contractor shall specify the proposed transportation/storage/disposal (TSD) facility. A commitment letter will be obtained from the TSD facility indicating the capacity to accept the type and volume of waste material and stating that it will be open for business during the Contract duration to accept the volume of waste materials. The Contractor shall ensure that the hauler of record and TSD facility possess the proper licenses, credentials and experience to transport and dispose of the subject material.

The Contractor shall provide the Authority with a list of permitted alternative TSD facilities to be utilized in the event the approved facility ceases to accept waste materials generated under this Contract. The Authority will not bear any additional costs if the alternative TSD facility is used for waste disposal.

The Contractor shall maintain a Daily Soil Tracking Log that will record the source location, type, quantity, and characteristics of all excavated, stockpiled, and transported regulated material.

The Contractor shall comply with all applicable regulations, including, but not limited to:

* Vehicle placard requirements
* Container requirements
* Manifest requirements
* Responsibilities and requirements for collectors and haulers of hazardous and non-hazardous solid waste
* Posted weight limitations on roads and bridges
* Other local restrictions on storage and transportation of waste/debris

Any material deemed hazardous shall be removed from the site within 90 days as per NJDEP regulations (N.J.A.C. 7:26). No hazardous material shall be reused.

Excess contaminated non-hazardous soil not designated for reuse as backfill material must be disposed off-site within 180 days of excavation as per NJDEP regulations (N.J.A.C. 7:26). The licensed hauler shall transport the contaminated soil directly to the selected disposal facility. A non-hazardous bill-of-lading (BOL) will be used to document the transportation and final disposition of contaminated soil during construction. The Authority will be identified as the generator associated with the BOL and the Authority or designee will sign each BOL. The soil designated for off-site disposal will be trucked off-site to the selected licensed TSD facility.

Containers of waste will be immediately sealed as each container is filled. The Contractor shall continuously maintain custody of all non-hazardous and hazardous material generated at the work site including security, short term storage, transportation and disposition until custody is transferred to the off-site TSD facility.

Should the disposal facility reject material transported from the site, and said material is returned to the Project site, the material shall be separately stockpiled in an area that does not “cross contaminate” other materials, compromise construction activities, or violate existing permits and approvals. The Contractor, in consultation with the Authority, shall assess said stockpiled material for disposal options.

Potentially contaminated soil designated for additional testing will be stockpiled in accordance with the Materials Handling Plan. The types and frequencies of tests to be conducted will be based on knowledge of the material, previous pre-characterization and waste characterization data, conditions encountered during excavation, and the permit requirements of the receiving recycling or disposal facility.

[Include the following for all Contracts that include waste disposal]

1. Waste Disposal Documentation

The Contractor shall maintain copies of all documentation and submit copies of each of the following to the Engineer:

* Waste characterization sampling logs, sample location maps, and laboratory analysis reports;
* Documentation of the disposal facility’s regulatory permit to accept waste and specific disposal analytical/procedural requirements criteria for accepting waste;
* Documentation of the disposal facility's acceptance of the regulated material prior to transporting any material off site;
* Transportation manifests/bills of lading; and,
* Waste disposal recycling documentation (e.g., weight tickets) in hard copy and electronic (spreadsheet) formats from the receiving facility.

Copies of each manifest/bill of lading shall be submitted to the Engineer within seven business days following transportation from the site, and within five business days after delivery to the disposal facility. All manifests/bills of lading must be fully executed by the disposal facility for this task to be considered complete.

1. Backfilling and Capping

[Include the following for all Contracts of linear construction Projects]

Excavated material from the linear construction corridor may be reused as backfill as long as it does not contain free or residual product (petroleum contaminated soil).

[Include the following for all Contracts for both linear construction and non-linear construction Projects where contaminated soil is being handled.]

Imported backfill material must comply with the NJDEP’s October 2021 Fill Material Guidance for SRP Sites. The Contractor shall submit the clean fill source and supporting documentation to the Engineer prior to the start of construction to demonstrate it meets certified clean fill requirements.

If the excavated soil is to be amended and reused, the excavated soil must be amended with material that meets the clean fill rules.

[Include the following for all Contracts that include handling of contaminated soil and groundwater]

1. Decontamination Procedures

The Contractor shall designate an area for implementing decontamination procedures (e.g., steam cleaning, manual scrubbing, etc.) for all equipment contacting contaminated material and vehicles leaving the site. The Contractor shall remove soil from the truck tires as needed to ensure that contamination is not tracked off site. In addition, all roads in the construction area will be swept to keep the roadway free of dirt and debris. Recovered wastes resulting from decontamination shall be properly characterized, transported and disposed off-site in accordance with applicable Federal, State, and local requirements.

[Include the following for all Contracts that include handling of contaminated groundwater]

1. Contaminated Groundwater Management Procedures

Groundwater dewatering during construction will be necessary. Groundwater throughout the Project is known to be or assumed to be contaminated (see Section 216.02). Thus, the contaminated dewatering fluids shall be removed from the excavation and disposed properly.

The Contractor shall select the groundwater disposal method based on anticipated dewatering rates, treatment options, proximity of storm sewers and surface water bodies, the permeability of the subsurface materials, and groundwater quality as determined by an Engineer engaged by the Contractor. The Pollution Prevention Control (PPC) Plan shall document the method for handling, treatment, and disposal of contaminated groundwater.

The potential options for managing the generated groundwater are:

1. Discharge to surface water;
2. Discharge to groundwater;
3. Discharge to a sanitary sewer; and
4. Transportation to a permitted treatment facility.

Discharge to surface water will require a New Jersey Pollutant Discharge Elimination System (NJPDES) Discharge to Surface Water (DSW) Permit issued by the NJDEP Division of Water Quality. The NJDEP provides a General Groundwater Remediation Cleanup (BGR) permit for non-petroleum contamination, which authorizes discharges of treated groundwater to surface waters.

NJPDES Discharge to Ground Water (DGW) Permits can also be issued by the NJDEP Site Remediation Program.

Discharge to a sanitary sewer will require a permit from the receiving utility.

If the dewatering effluent requires treatment prior to discharge to surface water or discharge to groundwater, it is likely that a Treatment Works Approval will be required from the NJDEP Division of Water Quality prior to application for the discharge permit.

The Contractor shall apply for and obtain a Construction Dewatering General Permit (B7) from the NJDEP Division of Water Quality for the authorization of a short term groundwater discharge for lowering the groundwater table during construction related dewatering of uncontaminated groundwater. Discharges associated with industrial processes, site remediation activities, and sanitary sewerage systems are not covered under the General Permit B7.

The Contractor shall also apply for and obtain a Water Allocation Permit from the NJDEP's Division of Water Supply and Geoscience, when the pumping or lowering of any groundwater at an average rate of 100,000 gallons per day, over a 30-day period.

Permitting information can be found on the following NJDEP permitting webpages:

* NJDEP BGR DSW Permitting: <https://www.nj.gov/dep/dwq/gp_bgr.htm>
* NJDEP DGW Permitting: <https://www.nj.gov/dep/dwq/dgw_home.htm>
* NJDEP Treatment Works Approval: <https://www.nj.gov/dep/dwq/twa.htm>
* NJDEP Dewatering Permitting: <https://www.state.nj.us/dep/watersupply/a_wtable.html>

At all times, the Contractor shall maintain and operate proper and ade­quate dewatering in order to keep the construction site dry and in such condition that construction of structures and placement and compaction of fill and backfill may proceed unhindered by saturation of the area. The Contractor shall provide and maintain pumps, well points, sumps, suction and discharge lines, or other dewatering sys­tem com­ponents necessary to convey all water away from excavations. The Contractor shall prevent surface water from flooding or spilling into excavations.

The Contractor shall obtain any local and State permits required for construction dewatering as discussed above. Cost of permits shall be paid by the Contractor. The Contractor shall adhere to all terms of the environmental permits.

All discharges from dewatering activities to surface waters, groundwater, or storm sewers shall be free of sediments. The Contractor shall collect effluent samples from the treatment system at the frequency required by the permit and analyze the samples for the parameters specified in the permit. The Contractor shall provide the sample results to the Engineer to document that the discharge meets the permit limits.

Division 300 - Pavement

Section 302 - Hot Mix Asphalt (HMA) Pavements

302.01 Description

Add the following to the end of this Subsection:

Asphalt binder grade designations PG64-22 and PG76-22 shall be considered equivalent to PG64S-22 and PG64E-22, respectively.

302.02 Materials

Remove the following:

Tack Coat 904.02

Add the following:

Trackless Tack Coat 904.02

Polymerized Joint Adhesive 904.11

[Include the following with bridge deck repair Contracts:]

[Note to Designer: All deck repair Contracts shall use HMA grade 64 Surface Course. If the existing surfacing exhibits moderate stress such as shoving and rutting, the designer can propose HMA grade 76 Surface Course at specific locations subject to the approval of the Authority’s Project Manager. Temporary Surfacing shall be the lowest grade surface course to be used in the Project.

Add the following language to the end of this Subsection:

The HMA Bridge Surfacing mixture to be used for Temporary Surfacing and the Force Account for Emergency and Routine Bridge Repairs shall be [Insert HMA Surface Course – See Note to Designer]

At the Contractor’s option and subject to the approval of the Engineer, the Contractor may use a higher grade HMA Surface Course for the Temporary Surfacing and the Force Account for Emergency and Routine Bridge Repairs at no at no additional cost to the Authority.

[Include the following with all contracts with HMA:]

Subject to approval of the Engineer, Contractor may substitute trackless tack coat for tack coat meeting the following requirements:

Tack coat material shall be undiluted Grade RS-1 or Grade SS-1 emulsified asphalt, conforming to the requirements of AASHTO M140 or Grade PG 64-22 conforming to the requirements of AASHTO MP1. Asphalt material grade RC-70 or RC-250 conforming to the requirements of AASTHO M81 may only be used when approved by the Engineer.

302.05 Methods of Construction

1. Preparation of Existing Surface

Rename Subparagraph (1) to the following:

Trackless Tack Coat

Delete the two tables in this Subparagraph and replace with the following:

|  |  |  |
| --- | --- | --- |
| **Minimum Tack Coat Application Rates (gallons per square yard)** | | |
|  | ***HMA*** | ***AR-OGFC*** |
| Over New HMA | 0.05 | 0.07 to 0.12 |
| Over Existing HMA and PCC Pavement | 0.07 | 0.11 |
| Over Milled Pavement | 0.10 | 0.12 |

|  |  |  |
| --- | --- | --- |
| ***Material*** | ***Spraying Temperature*** | ***Season*** |
| Trackless Tack Coat | 160° – 180°F | All Year |

Add the following language to the beginning of this Part:

1. Storage

The Contractor shall ensure Trackless Tack Coat storage tanks are clean and free of contaminants, especially cationic emulsified asphalt residue. The Contractor shall store Trackless Tack Coat at temperatures not exceeding 110 degrees F, unless otherwise approved by the Engineer and in accordance with the Manufacturer’s recommendations. The Contractor shall circulate or agitate the Trackless Tack Coat being stored for a minimum of 15 minutes per day unless otherwise approved by the Engineer and in accordance with the Manufacturer’s recommendations. The Contractor shall fill Trackless Tack Coat storage tanks from bottom up, unless otherwise approved by the Engineer and in accordance with the Manufacturer’s recommendations.

1. Heating and Circulation

The Contractor shall slowly heat the product to a temperature of 110 degrees F, then slowly increase the temperature to 160 degrees F while circulating the distributor tank at 100 to 150 gallons per minute. The Contractor shall circulate the spray bars upon reaching 160 degrees F.

1. Application

The Contractor shall not apply Trackless Tack Coat to dirty or wet surfaces. Trackless Tack Coat shall be applied using a distributor in accordance with Subsection 302.04, to all existing surfaces to be paved under the contract including but not limited to curbs, inlet grates, manholes, and other similar structures. Clean exposed surfaces of these structures and apply a uniform coating to contact surfaces prior to paving. The Contractor shall check the tank, pump, and spray bar for contamination prior to applying Trackless Tack Coat and flush cationic material if encountered.

In areas inaccessible to distributor spray bars, use hand spraying equipment for tack coat.

See manufacturer’s representative for correct distributor settings. Thoroughly clean all equipment if cationic emulsion was previously used.

Uniformly apply the asphalt material as noted above.

Dilution is not permitted.

If product is stored for an extended period of time or shows signs of separation, prior to application, agitate or gently circulate the material.

All nozzles and spray patterns shall be identical to one another along the distributor spray bar. The angle of the nozzles should be set at an angle between 15 and 30 degrees to the spray bar axis to maximize overlap or as recommended by the nozzle manufacturer. Contact the manufacturer’s representative for required spray nozzle size, and distributor and nozzle settings.

The Engineer will determine the actual application in gallons per square yard by a check on the project.

The application is considered satisfactory when the material is applied uniformly with no visible evidence of streaking or ridging and the application rate is within ±10% of the specified rate.

The Contractor shall not allow traffic or construction vehicles on tack coated surfaces until the emulsion has broken, or as otherwise directed by the Engineer.

The Contractor shall only apply tack coat that can be paved over in the same shift.

The Contractor shall follow the manufacturer’s requirements for distributor settings.

1. Tack Coat Bond Strength Requirements and Testing Methods

Trackless Tack Coat interlayer shear strength will be measured using the following testing method:

* AASHTO TP 114, Standard Method of Test of Determining the Interlayer Shear Strength (ISS) of Asphalt Pavement Layers

The minimum interlayer shear strength between any new HMA surface course on an existing asphalt or concrete pavement is as follows:

Laboratory Shear Testing

100 PSI minimum average for three (3) samples with no single value less than 50 PSI

Bond strength testing shall initially be performed during the test strip phase of the project. Do not begin production paving until laboratory shear testing results have met the minimum requirement. The Contractor shall repeat the test strip procedure until passing results are achieved.

The Engineer will direct additional testing during production paving to ensure that quality is being maintained. The frequency of testing will be determined by the Engineer.

When the tack coat bond strength fails to meet the minimum specified above, the Contractor shall suspend paving and submit a plan for corrective action. The Contractor shall not resume paving until the corrective action plan is approved by the Engineer. The Contractor shall repeat the test strips until acceptable results are achieved from three (3) randomly selected, 6 inches in diameter cores. The Contractor shall extract the cores and perform laboratory testing for interlayer shear strength. The sampling area will include all pavement constructed subsequent to the last acceptable bond strength test results. Any individual test sample value less than 50 psi is considered defective and subject to retesting. If retest fails the Contractor shall remove and replace the respective area. If subsequent test results fail to meet the minimum bond strength requirements, the Contractor shall remove and replace all Hot Mix Asphalt Pavement constructed where the defective tack coat was applied. The Contractor shall make adjustments to the equipment and/or materials as necessary to achieve the specified tack coat shear strength. The Contractor shall obtain a new material supplier and/or asphalt distribution method when subsequent strength test results fail. The Contractor shall resume paving operations only after acceptable bond strength has been demonstrated and the no exception is taken to the tack coat material by the Engineer. Suspension of paving operations due to defective tack coat shall not be subject to a time adjustment or pay adjustment under the Contract.

1. Tack Coat Application Rate Requirements and Testing Methods

Tack Coat spray and residual application rates shall be performed and calculated in accordance with ASTM D2995-14.

Crack Spanning Membrane Placement

Add the following to the end of this Subparagraph:

The crack spanning membrane shall be installed as per manufacturer’s recommendations.

1. Storing or Holding the Mixture

[Include the following with bridge deck repair Contracts:]

Add the following language to the end of the first paragraph:

The Contractor shall have at their disposal a portable heated asphalt storage unit with a minimum four ton capacity for the purpose of having hot mix available for the emergency pavement replacement and emergency concrete deck replacement items when material is not available from the asphalt plant. The asphalt storage unit shall be of triple wall construction heated with infrared propane gas burners that supply no more than 45,000 BTU per hour. The unit shall be capable of holding hot asphalt at the proper laydown temperatures for a minimum of 48 hours. The temperature of the inside skin of the storage unit shall not exceed 280ºF. Any associated cost shall be included in the unit prices bid for HMA items.

1. Placing Limitations

[Include the following with bridge deck repair Contracts:]

Add the following language to the end of the seventh paragraph:

Emergency and Routine Repairs

In the event that the HMA bridge surfacing cannot be placed at areas of deck slab replacement due to adverse weather conditions or other unforeseen events, the Contractor shall place temporary asphalt surfacing over the spall area, bridge resurfacing area or deck slab replacement area, when so directed by the Engineer, to allow the closed lane to be opened to traffic.

Just prior to placement of the temporary surfacing, the Contractor shall apply an approved bond breaker to the surface of the membrane waterproofing in order to facilitate subsequent removal of the temporary surfacing. Placement and compaction of the temporary surfacing shall be as specified herein for asphalt pavement courses.

After the affected lane can again be closed, the Contractor shall remove the temporary surfacing, being careful so as not to cause damage to the waterproofing membrane. Saw cutting shall be performed, as may be required, to properly and safely remove the temporary surfacing and to provide vertical faces in the existing adjacent asphalt surfacing. Any damage caused to the concrete deck slab shall be repaired to the satisfaction of the Engineer prior to placement of the HMA bridge surfacing. Any damage to the membrane waterproofing shall be repaired or the membrane replaced as directed by the Engineer. Repairs or replacement of membrane and/or repairs to concrete deck slabs shall be made by the Contractor at no additional cost to the Authority.

When placing HMA to the thicknesses specified in Subsection 302.01 the base temperature shall be 32º F or above and the minimum HMA laydown temperature (in the paver) shall be 290º F or above.

1. Spreading and Finishing

[Include the following with bridge deck repair Contracts:]

Add the following language to the end of the ninth paragraph:

In situations where paving is completed shortly before opening of the lane to traffic and the newly placed asphalt surfacing has not sufficiently cooled, the Contractor shall, upon direction by the Engineer, water down the pavement to accelerate the cooling off process. Any associated cost shall be included in the HMA items bid in the Proposal.

1. Joints

Replace Subparagraph (2) with the following:

For all longitudinal pavement joints which fall below 150°F or existing pavement to remain in place the Contractor shall thoroughly clean the joints to ensure they are free of dust and debris and apply polymerized joint adhesive over the entire joint. The Contractor shall uniformly apply a 1/8” thick coating of polymerized joint adhesive over the entire joint face. The material shall conform to the requirements set forth in Section 904 of these Specifications.

Add the following language to the end of this paragraph:

All transverse joints constructed at bridge abutment structures and Hot Mix Asphalt/Portland Cement Concrete Pavement (HMA/PCCP) interfaces at toll plazas shall be sawcut and sealed with hot poured joint sealant in accordance with the Plans, Subsection 904 in the Specifications, or as directed by the Engineer.

All transverse joints constructed against new and existing pavement to remain in place shall be surface sealed with asphalt cement viscosity Grade AC-20 in accordance with the Plans, these Specifications or as directed by the Engineer.

For all longitudinal pavement joints constructed against cold pavement or existing pavement to remain in place the Contractor shall thoroughly clean the joints to ensure they are free of dust and debris and apply polymerized joint adhesive over the entire joint.

Contractor shall uniformly apply a 1/8” thick coating of polymerized joint adhesive over the entire joint face. The material shall be applied slowly to ensure an even coating thickness. Polymerized joint adhesive material shall conform to the requirements set-forth in Section 904 of these Specifications.

1. Compaction
2. Compacted Thickness

[Include the following with all bridge deck repair Contracts:]

Add the following language to the end of this Subparagraph:

HMA paving mixture placed for bridge surfacing or for approach roadway surfacing shall be placed in one layer to the compacted thickness prescribed in the Standard Specifications which will achieve a smooth profile using the bridge armor joints and/or the bridge profile for control, or as directed by the Engineer. The details shown on the plans shall be followed for transitioning the new pavement to the existing pavement.

The Contractor shall pave so that in the final compacted state, the asphalt surfacing meets top of armoring or if there is no armor joint the surfacing meets joint headers or abutment headblocks with an allowable tolerance of + ⅛ inch to + ¼ inch. In order to achieve the desired grades, a smooth profile and a smooth riding pavement surface, the Contractor shall employ string lining to take elevations to establish pavement lift control points at the appropriate spacing, as necessary, to develop a profile that meets the aforementioned requirements.

Rolling

Add the following language to the end of this Subparagraph:

The use of vibrating rollers on bridges will not be permitted.

302.09 Measurement

Delete the fourth through thirteenth paragraphs and replace them with the following:

The Authority will make periodic price adjustments for asphalt binder usage. The Authority will calculate asphalt price adjustments based on the quantities of Pay Items containing asphalt binder constructed.

Each month will be divided into two periods. Period one includes the first day of the month through the fourteenth day of the month. Period two includes the fifteenth day of the month through the last day of the month. Work starting on the fourteenth day of the month and continuing past midnight into the fifteenth day of the month will be included in period one for any price adjustments. Work continuing through midnight of the last day of the month into the first day of the next month will be included in period two.

The asphalt price adjustment will be separated between asphalt binder grades PG 64-22 and PG 76-22. The price used for both the basic and monthly price indices will be determined based on the performance grade of asphalt binder in the approved mix design for the asphalt mixture.

Price adjustments may result in an increased payment to the Contractor for increases in the price index and may result in a reduction in payment for decreases in the price index.

The Authority will calculate the asphalt price adjustment by the following formula:

A = (MA − BA) \* T

Where:

A = Asphalt Price Adjustment

MA = Asphalt Price Index for work performed in the time-period immediately before the estimate cutoff date.

BA = Basic Asphalt Price Index

T = Tons of New Asphalt Binder 1

1. The Authority will determine the weight of asphalt binder for price adjustment by multiplying the percentage of new asphalt binder in the approved job mix formula by the weight of the item containing asphalt binder. If a hot mix asphalt Pay Item has a payment unit other than ton, the Authority will apply an appropriate conversion factor to determine the number of tons of asphalt binder used.

[Include the following, as needed, with all Contracts that include paving:]

Add the following language to the end of this Subsection:

Temporary Surfacing will be measured by the total weight of the asphalt concrete mixture required, placed as prescribed in the Plans, or otherwise directed by the Engineer, and as determined from certified scale weights. Temporary Surfacing will not be measured for payment when temporary surfacing is applied because the Contractor is not able to finish work within allowable lane, roadway, shoulder and/or ramp closing durations (see Division 800). Removal and disposal of temporary surfacing will not be measured separately for payment. Labor equipment and materials required for furnishing and applying bond breaking agent to the membrane waterproofing will not be measured separately for payment.

302.10 Payment

Add the following at the end of this Subsection:[Include the following with bridge deck repair Contracts:]

Payment for Temporary Surfacing will be made in accordance with Section 532.

No separate payment will be made for the labor, equipment and materials required for the removal and disposal of temporary surfacing, or for the furnishing and applying the bond breaking agent placed on the membrane waterproofing, but the costs thereof will be paid for under Section 532. No payment will be made for temporary surfacing that is installed because the Contractor is not able to finish work within allowable lane, roadway, shoulder and/or ramp closing durations (see Division 800).

[Include the following with all contracts with HMA:]

Delete the following:

***PAY ITEM PAY UNIT***

Tack Coat Gallon

Add the following:

***PAY ITEM PAY UNIT***

Trackless Tack Coat Gallon

Section 304 – Portland Cement Concrete Pavement

[Include the following with Contracts that include sawcut grooving:]

304.04 Methods of Construction

1. Surface Texture

The second paragraph is deleted and replaced with the following:

Grooves for new or completely resurfaced bridge decks shall be rectangular in shape and shall conform to the following dimensions:

Width 1/8 inch ± 1/32 inch

Depth 3/16 inch ± 1/16 inch

Spacing 3/4 inch ± 1/16 inch

1. Defective Work

Replace the last sentence with the following:

If such examination discloses the pavement to be of less than the required thickness, or to contain cracks or other defects, the Engineer will require the Contractor to remove such defective work and replace it with pavement meeting the requirements of the Plans and Specifications, without cost to the Authority, in accordance with Subsection 905.23(E).

304.06 Payment

[Include the following with Contracts that include concrete:]

The third paragraph after the pay item table is replaced with the following:

Quality acceptance for strength and durability for the various Portland cement concrete items, listed above, will be made in accordance with Subsection 905.23.

Division 400 - Structures

[Include the following with new bridge construction or deck construction Contracts:]

Section 401 – Concrete Structures

401.02 Materials

Remove the following:

Joint Materials 907

Non-Shrink Grout 905.12

Reinforcement Steel 908.01

Support Bars for Reinforcement Steel 908.01

Add the following:

Joints 907

Non-shrink Grout 905.10

Reinforcement Steel 908

Support Bars for Reinforcement Steel. 908.01(K)

Zinc Coating on Steel 909.11

[NOTE TO DESIGNER: Include the following in Contracts that specify the use of field-bent galvanized reinforcement in decks, parapets, median barriers, or other limited-use locations for bridge deck repair, rehabilitation or replacement Contracts. Use of ASTM A1094 reinforcement shall be approved by the Authority prior to inclusion in the Contract Documents:]

401.09 Reinforcement Steel

Add the following after the second paragraph:

Bending of ASTM A767, Class I hot-dip galvanized reinforcement steel after galvanizing will not be permitted. Minor bending of ASTM A1094 continuous hot-dip galvanized reinforcement steel after galvanizing is acceptable where required in the field for final fit to achieve cover requirements.

Add the following to the end of the eleventh paragraph:

Repairs shall be made to all damaged galvanized coating on reinforcement steel in accordance with Paragraph 908.01(F). Any damage to the galvanized coating of ASTM A767, Class 1 or ASTM A1094 galvanized reinforcement steel during fabrication, transport, storage or installation, including during field bending or straightening of ASTM A1094 reinforcement, shall be repaired with a zinc-rich formulation in accordance with ASTM A780. If damage to either the epoxy or the galvanized coating is considered significant or not repairable, as determined by the Engineer, the reinforcement steel bar will be rejected and shall be replaced by the Contractor at no additional cost to the Authority.

401.12 Machine Finishing of Bridge Decks

1. Deck Surface Requirements

Delete the sixth paragraph in its entirety and replace with the following:

After the bridge decks and approach slabs are completed, a qualified Deck Rideability QC Contractor shall perform a ride quality test using an approved lightweight road profiler as specified in Subsection 923.44.

Add the following:

1. Ride Quality Test

High speed profilographs and simulated profilographs will not be permitted as an approved equal.

The QC Contractor shall conduct the test as follows:

1. Obtain profile index values for bridge deck slabs and approach slabs.
2. Obtain profiles in each wheel path (2 feet off lane line) of each lane and in shoulder areas to within 12 inches of the barrier parapet.
3. Average the profile index values for the bridge deck slab including the approach slabs for each of the left and right wheel path for each lane. The average value must not exceed **15 inch/mile (**as computed by the test equipment) for each lane.
4. **Localized Slab Requirements** - After the test is complete, correct individual bumps or depressions that exceed 2/10 inch from the blanking band on the profilograph trace. (These are localized areas that the trace has defined during the full length test on the deck and approach slab.)

The deck surface must then meet a 1/8 inch in 10 feet straightedge check made longitudinally and transversely.

The Engineer will be made witness to all profilograph measurements and review/approve all index calculations.

Correct the major and localized areas of the bridge deck and approach slabs identified above that do not pass the Ride Quality Test, as described in [Subsection 401.12 (D) (2) “Corrective Work”](http://tomcat2.dot.state.ga.us/thesource/pdf/specs/ss500.html#X500305AG), presented below.

Corrective Work

After the test described in [Subsection 401.12 (D) (1) “Ride Quality](http://tomcat2.dot.state.ga.us/thesource/pdf/specs/ss500.html#X500306E) [Test”](http://tomcat2.dot.state.ga.us/thesource/pdf/specs/ss500.html#X500306E) has been performed, complete the corrective work, if required, at no cost to the Authority and before doing the final saw cut grooving.

Complete corrective work as follows:

Plane the deck according to [Subsection 401.12 (D) (3) “Grind Bridge Deck.”](http://tomcat2.dot.state.ga.us/thesource/pdf/specs/ss431.html)

1. Limit concrete removal by planning so that the final bar cover is not less than the Plan cover minus 1/2 inch (13 mm).
2. If the final bar cover limits cannot be met, perform the corrective work as directed by the Engineer.
3. Ensure that the final riding surface complies with this Specification and the requirements for a saw cut grooving finish per Subsection 401.17(F) (3).
4. If necessary, use a hand grinder to correct bumps with a profile base line of 5 feet (1.5 m) or less.
5. Have planed surface retested as described in [Subsection 401.12 (D) (1) “Ride Quality Test,”](http://tomcat2.dot.state.ga.us/thesource/pdf/specs/ss500.html#X500306E) to ensure that the ride quality meets the requirements of this Specification.

Grind Bridge Deck

This work includes grinding concrete bridge decks and approach slabs to provide proper drainage and riding characteristics to the pavement surface. Perform the work according to these Specifications and the Plans. Sawcut grooved finish shall be performed after all of the bridge deck slab and approach slabs have been checked for conformance to the specification, and all corrective work has been completed.

1. Referenced Documents

Georgia Department of Transportation Test No. 78 (See Appendix H).

1. Personnel

Deck Rideability QC Contractor’s personnel shall meet the requirements set forth under Subsection 104.06.

1. Equipment
2. Grinding Equipment

Use power driven, self-propelled grinding equipment with these characteristics:

* + - * Diamond blades designed to smooth and texture Portland Cement concrete pavement
      * Effective wheel base of at least 12 feet
      * Pivoting tandem bogey wheels at the front of the machine
      * Rear wheels arranged to travel in the track of the freshly cut pavement
      * Grinding head with the center no further than 3 feet forward from the center of the back wheels

Ensure that the equipment:

* + - * Cuts or planes at least 3 feet wide
      * Operates without encroaching on traffic movement outside the work area
      * Grinds the surface without causing spalls at cracks, joints, or other locations

Periodically check the equipment to ensure that it is in proper working order, especially the wheel “roundness” on the grinding equipment. Immediately correct “out-of-round” wheels.

1. Profilograph

Use the profilograph to test the ride quality of the surface of concrete bridge decks and approach slabs.

1. Construction

Grind the deck slab and approach slab surface areas that do not conform to smoothness requirements defined under Subsection 401.12 (F)(1) “Ride Quality Test”, or as required to promote drainage.

Grind the surface areas as follows:

* Maintain a constant cross slope between grinding extremities in each lane to ensure that grinding provides positive lateral drainage.
* Grind the entire area designated by the Engineer until the deck slab surfaces of the adjacent sides of transverse joints are in the same plane.
* Texture the deck surface, but do not grind extra depth to eliminate minor depressions.
* Remove grinding residue before it is blown by traffic action or wind. Do not allow residue to flow into gutters, drainage facilities, or across lanes used by public traffic.
* To regrind areas to meet the smoothness or final surface finish, regrind the entire lane width in the area to be corrected. Regrinding of just a portion of the lane width, such as the wheel paths only, will not be permitted.

[Include the following with new bridge construction or deck construction Contracts:]

401.16 Test Specimens

Delete the entire Subsection and replace it with the following:

This Subsection specifies the requirements for the preparation, testing and evaluation of Portland cement concrete specimens. Final quality acceptance testing shall be in accordance with Section 905. In order that the Engineer can maintain a record of the strength gain of all concrete placed, the Engineer will make standard test specimens: 4” x 8” or 6" x 12" concrete test cylinders for ASTM C39 compressive strength testing, 4” x 8” cylinders for AASHTO T277 and AASHTO TP358 and 6” x 6” x 3” molds for AASHTO T259/T260 permeability testing, and 4” x 4” x 14” or 6” x 6” x 20” molds for ASTM C78 flexural strength testing. The Contractor shall provide the concrete and molds for the test specimens, shall be responsible for the handling and protection of the specimens on the job site and shall arrange for delivery of the specimens to the designated testing laboratory between 24 and 48 hours after casting.

1. Test Specimen Preparation

A sufficient number of curing facilities for the storage and curing of concrete test specimens on the project site for the time required by ASTM C 31 shall be provided as approved by the Engineer at the expense of the Contractor and for the sole use of the Authority. The curing facilities shall be provided with a minimum-maximum thermometer and shall be securable with lock and key. If curing facilities are not provided as required, the Engineer will instruct the Contractor to provide such facilities. During the initial 24 hours, the Contractor is solely responsible for ensuring that the test specimens are undisturbed and maintained within the specified temperature range. The test facilities shall be provided when requested by the Engineer. The Contractor shall not be allowed to place any concrete until all needed test facilities are provided.

The cost of the concrete cylinder molds, care of the specimens on the site, and transporting the specimens to the testing laboratory shall be borne by the Contractor and shall be included in the price bid for the concrete item or items scheduled in the Proposal. The Authority will pay the costs of performing the tests at the testing laboratory.

1. Standard and Frequency of Testing Prior to Final Acceptance Testing

Some or all of the following procedures will be used by the Engineer to evaluate in-place concrete prior to final quality acceptance testing in accordance with Section 905.

1. Compressive Strength Testing (ASTM C39)

In accordance with ASTM C31 and ACI 318-99 - Part 3, Chapter 5, Item 5.6, entitled “Evaluation and Acceptance of Concrete”, except that samples will be done on a random basis with a minimum of two cylinders prepared for each sublot, as defined in Subsection 905.22. If 3-day and 7-day testing is requested by the Engineer for Portland cement concrete, four test cylinders will be prepared for each sublot. The Engineer will calculate the average of two test specimens at the design compressive strength time requirement for the material. The average of the two test specimen result values for each sublot at the design compressive strength time requirement shall be considered the sublot compressive strength value. The specimens will be made and cured in accordance with the requirements of ASTM C31 except submersion in water storage containers shall be used in lieu of moist room curing if required by the Engineer for hot weather concreting of Portland cement concrete.

If the strength test results of a seven-day compressive strength test indicate that the concrete may not develop the minimum 28-day compressive strength specified, the Engineer reserves the right to order the Contractor to immediately core the portion of the concrete structure represented by that cylinder for testing purposes. The coring shall be made of the size and at the locations ordered. If the results of the core tests indicate that, in the sole opinion of the Engineer, the expected rate of increase in strength is not sufficient to produce a satisfactory compressive strength at 28 days, the portion of the concrete structure represented by the core shall be removed and disposed of, and replaced with new construction.

If the results of the core tests indicate, in the sole opinion of the Engineer, that a satisfactory 28-day compressive strength may yet be realized, possible rejection or pay adjustment of the concrete in question will be deferred until the 28-day cylinders are tested in accordance with Subsection 905.22.

All coring and filling core holes with concrete, as outlined in the two preceding paragraphs, shall be entirely at the Contractor's expense; core testing will be done at the Authority's expense in accordance with Subsection 105.03

1. Permeability Testing (AASHTO T277, AASHTO TP358 and AASHTO T259/T260)

The “Coulomb Test” (AASHTO T277), “Surface Resistivity Test” (AASHTO TP358) and “Ponding Test” (AASHTO T259/T260) are used to evaluate the permeability of concrete. Two-inch thick samples will be cut from the center of each cylinder for AASHTO T277 testing, with a maximum of two slices per cylinder utilized. Samples shall be wet cured in water storage containers per ASTM C31 for 2 days, and air cured at the site for 3 days, prior to pick-up for testing. Additionally, the two (2) 6” x 6”x 3” molds will be tested for permeability in accordance with AASHTO T259/T260.

1. Flexural Strength Testing (ASTM C78)

The “Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)” (ASTM C78) is used to determine the flexural strength of concrete by the use of a simple beam with third-point loading. Samples shall be formed within 4” x 4” x 14” or 6” x 6” x 20” molds in conformance to ASTM C31.

Removal and replacement of deficient concrete, as previously outlined, shall be entirely at the Contractor's expense.

Refer to Subsections 905.21, 905.22 and 905.23, including modifications made in the Supplementary Specifications, for requirements of quality acceptance limit, testing and sampling.

401.20 Joint Sealers

Replace all instances of the word “elastic” with “elastomeric”.

401.23 Measurement

Replace all instances of the word “elastic” with “elastomeric”.

[Include the following with new bridge construction or deck construction Contracts:]

401.24 Payment

The first paragraph after the pay item table is replaced with the following:

Quality acceptance for strength and durability for the Items “Concrete Foundations for Ground Mounted Signs” and “Concrete Foundations for Overhead Sign Structures” will be made in accordance with the specified Performance Criteria Category within Table 2 of Subsection 905.23.

Section 403 – Steel Structures

403.06 Fabrication and Welding

Include the following in Contracts that include pedestrian bridges:

Add the following to the end of this Subsection:

Formed steel flooring plates shall be welded at the supports with two ⅛ by 1 inch fillet welds through the holes in each valley. The lapped edges of adjacent plates shall be welded together with a bead, 3 inches long, midway in the span between supports.

[Include the following with any Contract requiring formed steel flooring]

403.18 Measurement

Add the following to the end of this Subsection:

Formed steel flooring will be measured by the square foot.

403.19 Payment

Add the following to the pay item table:

***PAY ITEM PAY UNIT***

Formed Steel Flooring for Pedestrian Bridges Square Foot

[Include as needed with timber fender repair Contracts:]

Section 405 - Piles

405.01 Description

Add the following language to the end of this Subsection:

This section shall apply to furnishing, driving and cutting new treated timber piles or steel pipe piles, including dolphins (pile clusters) and battered piles, removal of an upper section of an existing pile and furnishing and placing new piles with pile shoe at the prescribed locations in accordance with the Plans and Specifications. Pile shall be 70 foot in length for vertical and 80 foot for battered piles.

No test piles or pile load tests will be required.

[Include for Authority furnished sign structures.]

Section 406 - Sign Support Structures

406.01 Description

Add the following language to the end of this Subsection:

This work shall also consist of the picking up, transporting to the site, and erecting the sign support truss assemblies and end frames that will be provided by the Authority. This work shall also consist of the removal and salvaging of existing overhead sign structures.

[Include for Authority furnished ground mounted sign structures.]

Add the following language to the end of this Subsection:

This work shall also consist of the picking up, transporting to the site, and erecting the ground mounted sign support posts or poles and signs that will be provided by the Authority. This work shall also consist of the removal and salvaging of existing ground mounted sign.[Include for Authority furnished ground mounted sign structures.]

406.02 Materials

Add the following language to the end of this Subsection:

Dense Graded Aggregate Base 902.07

Joint Sealer(S) 907.02

Timber Posts for Ground-Mounted Signs 910.12

406.04 Fabrication

Add the following language to the end of this Subsection:

Fabricating and furnishing of the overhead sign support truss assemblies and end frames will be by others. The sign support structures will be stored at the Authority’s storage yard located at [insert location]**.**

[Include for Authority furnished ground mounted sign structures.]

Add the following:

Fabricating and furnishing of the ground mounted sign support posts or poles and signs will be by others. The sign support structures will be stored at the Authority’s storage yard located at [insert location].

[Include for all Contracts with timber supported ground mounted sign structures.]

1. Supports For Ground Mounted Signs

Add the following language to the end of this paragraph:

Timber posts and poles for ground mounted signs shall be fabricated from lumber of the sizes and lengths called for on the plans or as determined from field conditions.

1. Sign Support Truss, Hangers, Walkway and Railway

Add the following language to the end of this paragraph:

The Authority will provide the sign support truss assemblies and end frames and the Contractor shall furnish, fabricate and install all other materials, such as sign hangers, horizontal support arms for walkways and luminaire support channels, walkway gratings, luminaire support channels, handrails, maintenance ladders and any other miscellaneous hardware necessary to make a complete installation at each location.

The Authority will provide the ground mounted sign support posts or poles and signs and the Contractor shall furnish, fabricate and install all other materials, such as sign hangers, and any other miscellaneous hardware necessary to make a complete installation at each location.

406.05 Erection of Sign Support Systems

Add the following language to the end of the first paragraph:

Prior to removing an existing sign structure or installing a new one, the Contractor shall submit details of the operation to the Engineer for approval at least 72 hours in advance.

[Include in Contracts involving removal of existing overhead sign structures.]

The following existing overhead sign structures shall be removed as a part of this Contract:

Span Sign Structure No. [insert number], located at [insert location].

Cantilever Sign Structure No. [insert number**]**, located at [insert location].

Butterfly Sign Structure No. [insert number], located at [insert location].

These existing sign structures shall not be removed until they are no longer necessary. Any existing sign panels that conflict with a new traffic pattern shall immediately be removed from the sign structure and the sign illumination shall also be disconnected.

All sign panels, truss frames, arms, walkways, lighting, hardware, etc. that is deemed salvageable by the Engineer will be loaded, transported and off-loaded by the Contractor to the Authority’s storage yard located at [insert location]. Any non-salvageable items shall be disposed of in a satisfactory manner off Authority property by the Contractor.

[Include for Authority furnished ground mounted sign structures.]

406.06 Sign Structure Foundations

1. Foundations For Ground Mounted Signs

Add the following language to the end of this paragraph:

Install stainless steel bolt, lock washer and nut in the bottom of the sleeve. Place timber post, with shim plates attached, in the sleeve in the excavated foundation. Carefully set the sleeve, using the temporary framing to ensure proper location. Seal the opening between the post and concrete with silicone joint sealer to prevent water infiltration into the sleeve.

Limit field cutting of posts or poles to a minimum. Field treat the cut area with the original post or pole preservative.

Sign structure footings shall be removed to a depth two (2) feet below finished grade and backfilled. Removal of the sign structures and footings shall be performed with extreme care so as to avoid damage to the facilities of the Authority and to prevent any needless interference or delays to Authority patron traffic.

[Include for Authority furnished sign structure.]

The following overhead sign structures shall be erected as part of this Contract:

Span Sign Structure No. [insert number**]**, located at [insert location**]**.

Cantilever Sign Structure No. **[**insert number**]**, located at **[**insert location**]**.

Butterfly Sign Structure No. **[**insert number**]**, located at **[**insert location**]**.

The Authority will furnish the sign support truss assemblies and end frames and the Contractor is responsible for furnishing all labor equipment necessary for delivering these items to the job site, erecting them on new pedestals, furnishing and installing all other required materials, such as sign hangers, horizontal support arms for walkways and luminaire support channels, walkway gratings, luminaire support channels, handrails, maintenance ladders and miscellaneous hardware resulting in a completed overhead sign structure in accordance with the plans, specifications and as directed by the Engineer.

Removal and salvaging of electronic sign systems from overhead sign structures that are to be removed shall be as specified in Division 600*.*

406.07 Measurement

[Include for Contracts involving removal of existing sign structures.]

Add the following language to the end of this Subsection:

Removal of overhead sign structures will be measured on a lump sum basis for each span, cantilever or butterfly type sign structure, and shall also include the removal of the existing footings and the delivery of all salvageable components as described in Section 406.05.

[Include for Authority furnished ground mounted sign panels.]

Timber posts and poles for all Ground Mounted Signs will be measured in Linear Feet.

Excavation, formwork, concrete, steel post sleeves and fasteners for timber posts for Ground Mounted Signs will not be measured for payment, but the cost thereof shall be included in the bid price for the Timber Posts and Timber Poles.

[Include for Authority furnished sign structures.]

Installation of new overhead sign structures will be measured on a lump sum basis for each span, cantilever or butterfly type sign structure, and shall include the pickup, delivery and complete installation as described in Section 406.05.

406.08 Payment

Replace the first paragraph after the pay item table with the following:

Quality acceptance for strength and durability for the Items “Concrete Foundations for Ground Mounted Signs” and “Concrete Foundations for Overhead Sign Structures” will be made in accordance with the specified Performance Criteria Category within Table 2 of Subsection 905.23.

Add the following:

***PAY ITEM PAY UNIT***

Remove Existing Span Sign Structure No. \_\_\_\_\_ Lump Sum

Remove Existing Cantilever Sign Structure No. \_\_\_\_\_ Lump Sum

Remove Existing Butterfly Sign Structure No. \_\_\_\_\_ Lump Sum

Install Overhead Span Sign Structure No. \_\_\_\_\_ Lump Sum

Install Overhead Cantilever Sign Structure No. \_\_\_\_\_ Lump Sum

Install Overhead Butterfly Sign Structure No. \_\_\_\_\_ Lump Sum

[Include for Authority furnished ground mounted sign panels.]

***PAY ITEM PAY UNIT***

Timber Posts, \_\_” x \_\_” Linear Feet

Timber Poles, Class Linear Feet

Removal and salvaging of electronic sign systems from overhead sign structures that are to be removed shall be paid for separately under Division 600.

[Include the following in contracts with HLMR bearings:]

Section 407 – High-Load Multi-Rotational Bearings

407.02 Materials

Remove the following:

Preformed Fabric Reinforced Elastomeric Bearing Pads 923.02(C)

Add the following:

Preformed Fabric Reinforced Elastomeric Bearing Pads 923.02(B)

High-Load Multi-Rotational Bearings 928.01

407.03 Qualified Manufacturers

Delete this entire Subsection.

[Include the following in contracts with laminated elastomeric bearings:]

Section 408 –Laminated Elastomeric Bearings

408.02 Materials

Add the following:

Laminated Elastomeric Bearings 928.02

408.03 Qualified Manufacturers

Delete this entire Subsection.

[Include the following in contracts with seismic isolation bearings:]

Section 409 - Seismic Isolation Bearings

409.03 Qualified Isolator Manufacturers

Delete the first paragraph and replace it with the following:

Refer to the Subsection 928.03 for approved suppliers.

Replace the first sentence of the second paragraph with the following:

Substitution of an alternate isolation system not referenced above may be acceptable provided all revisions necessary to accommodate this substitution are completed by the Contractor to the satisfaction of the Engineer

[The following shall be completed on a Project to Project basis:]

Add the following language to the end of the fourth paragraph:

The acceleration response spectra with[an X%]probability of exceedance in [XX]years is as follows:

|  |  |
| --- | --- |
| Table 409-1 Acceleration Response Spectra | |
| T (sec) | Sa (g) |
| X.XX | X.XXX |

Section 414 ‑ Bridge Railing And Fencing

414.02 Materials

Remove the following:

Caulking Sealant 923.25

Add the following:

Caulking Compound 923.05

Section 416 – Permanent Sheeting

[Include the following if relevant to the Project’s scope of work:]

416.02 Materials

Delete the materials reference to “Coal Tar Epoxy-Polyamide Coating” and replace it with the following:

Coal Tar Epoxy Coating 913.06

Section 417 - Bridge Deck Rehabilitation

Replace all instances of the phrase “blended cement patch mix” with “non-shrink high early strength mortar”.

Replace all instances of the phrase “field anti-corrosion coating” or “field applied anti-corrosion coating” with “anti-corrosion coating”.

417.01 Description

Add the following language to the end of this Subsection:

This work shall also consist of sawcutting the edges of existing pavement overlay and approach pavement to the depth shown on the Plans or as required by the manufacturer of the new deck joints; the removal and disposal of existing materials encountered within the limits of the new joint system including the cutting and removal of the existing steel armoring and plates, and the removal of the existing joint sealers, concrete deck and concrete headers; and the furnishing and installation of the complete elastomeric asphaltic plug joint system including new caulk, sealer, and steel plate. Replacement of joints and joint material at barrier curbs, parapets and sidewalks with an elastic joint sealer is considered to be part of this item of work.

417.02 Materials

Delete the list of materials and replace with the following:

Anti-Corrosion Coating 923.32

High-Tensile-Strength Bolts, Nuts and Washers 909.02(A)

Hot Poured Joint Sealant 904.06(A)

Mortar Seal and Cure 905.24

Non-metallic, Non-Shrink, Mortar or Grout 905.13

Non-Shrink, High Early Strength Mortar 905.15

Non-Shrink, High-Strength Mortar, Bare Concrete Decks 905.14

Non-Shrink, High-Strength Mortar, Paved Concrete Decks 905.12

Epoxy Resin System 923.22

Portland Cement 905.01

Preformed Elastomeric Joint Sealer 907.03

Preformed Expansion Joint Filler 907.01

Preformed Joint Sealer 907.02(D)

Deformed Bars, Epoxy Coated 908.01(B)

Reinforcement Bar Coupler 908.01(L)

Rubber Asphalt Concrete 907.08

Silicone Joint Seal 907.02(E)

Skid Resistant Coating 923.20

Strip Seal Expansion Joint 907.07

Structural Steel 909.01

Timber Fire Retardant Treatment 910.13

Membrane Waterproofing for Bridge decks 923.06(D)

Water Repellent Treatment 923.06(F)

Waterstops 923.17

Delete the entire table and replace it with the following:

| **Repair** | **Material Description** |
| --- | --- |
| **Concrete Deck Replacements and deck repairs** | **Class A concrete.** |
| **Concrete deck replacements and deck repairs with construction duration less than four (4) days but greater than 24 hours** | **Class A, High Early Strength concrete.** |
| **Deck repairs with construction duration less than 24 hours** | **Non-shrink, high-early strength mortar for bare concrete decks and mortar seal and cure.** |
| **Concrete Bridge Barriers** | **Class A concrete** |
| **Emergency concrete deck replacement** | **Class A, High Early Strength concrete unless limited time durations. Non-shrink, high early strength mortar for bare concrete decks and mortar seal and cure.** |
| **Spall Repair, Type 1** | **Non-shrink, high-strength mortar for bare concrete decks, non-shrink, mortar seal and cure, high-strength mortar for paved concrete decks, waterproofing membrane for bridge decks, and HMA Bridge Surfacing.** |
| **Spall Repair, Type 2** | **Non-shrink high-strength mortar for paved concrete decks, waterproofing membrane for bridge decks, and HMA Bridge Surfacing.** |
| **Spall Repair, Type 3** | **No longer used.** |
| **Spall Repair, Type 4** | **Class A concrete, waterproofing membrane for bridge decks, and HMA Bridge Surfacing as necessary.** |
| **Spall Repair, Type 5** | **Non-shrink, high early strength mortar for paved concrete decks, non-shrink, high early strength mortar for bare concrete decks, and mortar seal and cure.** |
| **Spall Repair, Type 5A** | **Non-shrink, high early strength mortar for paved concrete decks.** |
| **Spall Repair, Type 5B** | **Non-shrink, high early strength mortar for paved concrete decks.** |
| **Emergency Spall Repair, Type 5** | **Non-shrink, high early strength mortar for bare concrete decks, and mortar seal and cure.** |
| **Spall Repair, Type 6** | **Class A concrete, membrane waterproofing for bridge decks, and HMA Bridge Surfacing** |
| **Spall Repair, Type 6A** | **Non-shrink, high early strength mortar.** |
| **Emergency Spall Repair, Type 6** | **Non-shrink, high-early strength mortar for paved concrete decks, membrane waterproofing for bridge decks, and HMA Bridge Surfacing.** |
| **Spall Repair, Type U** | **Non-shrink, high early strength mortar suitable for vertical and overhead repairs.** |
| **Joint Reconstruction, Type 1** | **Elastomeric concrete.** |
| **Emergency Joint Reconstruction, Type 1** | **Non-shrink, high strength mortar for bare concrete decks, mortar seal and cure, and non-shrink high-strength mortar for paved concrete decks.** |
| **Joint Reconstruction, Type 1A** | **Class A concrete unless limited time durations (Non-shrink, high early strength mortar). See Paragraph 417.07(D).** |
| **Joint Reconstruction, Type 1P** | **Rubber asphalt concrete.** |
| **Joint Replacement, Type 1P** | **Rubber asphalt concrete.** |
| **Joint Reconstruction, Type F** | **Strip Seal Expansion Joint.** |
| **Joint Reconstruction, Type FJ** | **Preformed Joint Filler, Waterstop, Crack Spanning Membrane.** |
| **Joint Seal Replacement, Type \_\_\_** | **Preformed Elastomeric Joint Sealer.** |
| Joint Seal Replacement, Type IV \_\_\_\_ | Preformed Elastomeric Joint Sealer. |
| **Silicone Joint Sealer** | **Silicone Joint Seal.** |
| **Deck Joint Reconstruction** | **Match the adjacent deck reconstruction material. If no reconstruction scheduled, use Class A concrete.** |
| **Headblock Repair, Type 1** | **Class A, High Early Strength concrete.** |
| **Headblock Repair, Type 2 and Type 3** | **Class A concrete.** |
| **Headblock Repair, Type 1, Type 2 and Type 3 with construction duration less than four (4) days but greater than 24 hours** | **Class A, High Early Strength concrete.** |
| **Emergency Headblock Repair** | **Non-shrink, high early strength mortar for bare concrete decks, and mortar seal and cure.** |
| **Sidewalk, Safety walk and Curb Surface Repairs** | **Class B concrete.** |
| **Concrete Parapet Repairs** | **Class A concrete with water repellent treatment.** |
| **Parapet Surface Repairs** | **Class B concrete.** |
| **Parapet/Median Barrier replacement or reconstruction** | **Class A concrete/High Performance Concrete.** |

1. Delivery of Materials

(1) Materials Delivered to Maintenance Facility

Delete the second table in this Subparagraph and replace it with the following:

| **Material** | **Quantity** |
| --- | --- |
| **Non-Shrink, High Early Strength Mortar with at least one-year shelf life** | **56 – 50 lb. bags (1 pallet)** |
| **#6 Epoxy Coated Reinforcement Bars (5 ft. Length)** | **200 Each** |
| **#6 Epoxy Coated Reinforcement Bars (10 ft. Length)** | **100 Each** |

1. Materials to be Stockpiled in Contractor’s Staging Area

Delete the entire table and replace with the following:

| **Material** | **Quantity** |
| --- | --- |
| **Non-Shrink, High Early Strength Mortar with at least one-year shelf life, to yield 2 C.Y. Each** | **4 Each** |
| **Tie wire** | **1 Case** |
| **#5 Epoxy Coated Reinforcement Bars (25 ft. Length)** | **120 Each** |
| **#6 Epoxy Coated Reinforcement Bars (20 ft. Length)** | **70 Each** |

417.04 Concrete Deck Replacement

1. Concrete Deck Slab Construction
2. Membrane Waterproofing for Bridge Decks and HMA Bridge Surfacing

Delete the entire table and replace with the following:

| **Membrane Waterproofing Application Table** | | |
| --- | --- | --- |
| **Repair Item** | **Material Specified** | **Minimum Cure Time Prior to Membrane Application** |
| **Concrete Deck Replacement**  **(Large Areas)** | **Class A**  **Class A “high early”** | **48 hours**  **36 hours** |
| **Emergency Concrete Deck Replacement (Individual Panel, Non-Scheduled)** | **Class A “high early” with**  **water reducer** | **24 hours** |
| **Spall Repair, Various Types** | **Non-Shrink, High Strength Mortar (905.12)**  **Non-Shrink, High Early Strength Mortar (905.15)** | **12 hours**  **3 hours** |
| **Spall Repair Type 4 (Small Area)** | **Class A**  **Class A “high early”** | **48 hours**  **24 hours** |
| **Spall Repair Type 5**  **(Small Areas)** | **Non-Shrink, High Early Strength Mortar (905.15)** | **3 hours** |
| **Spall Repair Type 6 (Small Area)** | **Class A**  **Class A “high early”** | **48 hours**  **24 hours** |
| **Emergency Spall Repair  Type 5**  **(Small Repair, Non-Scheduled)** | **Non-Shrink, High Early Strength Mortar (905.12)** | **2 hours** |
| **Emergency Spall Repair  Type 6**  **(Small Repair, Non-Scheduled)** | **Non-Shrink, High Early Strength Mortar (905.12)** | **2 hours** |

417.13 Measurement

Replace all instances of the phrase “rapid set mortar, reinforcement bars, cement patch mix,” with “Non-shrink high early strength mortar, non-shrink high strength mortar, reinforcement bars”.

417.14 Payment

Replace the first paragraph with the following:

Quality acceptance for strength and durability for the various Portland cement concrete items listed above with an asterisk will be made in accordance with the specified Performance Criteria Category within Table 2 of Subsection 905.23.

Section 418 - Bridge Structural Repairs

418.02 Materials

Delete this Subsection in its entirety and replace it with the following:

Materials for bridge structural repairs shall conform to Subsections 401.02, 403.02, and Division 900.

Epoxy Crack Sealant 923.23

Epoxy Mortar 923.09

Epoxy Resin System 923.22

Epoxy Resin Waterproofing 923.06(E)

Epoxy Bonding Compound 923.08

Fasteners 909.02

Paints And Coatings 913

Pins and Rollers 909.03

Bronze Bearing Plates 911.07

Bearing Pads 923.02

Sealant 923.28

Bonding Agent 923.31

Anti-Corrosion Coating 923.32

Non-shrink, High Strength Mortar 905.12

Waterstops 923.17

Laminated Elastomeric Bearings 928.02

Reinforcement Steel for Structures 908.01

Welded Wire Fabric 908.01(C)

Portland Cement 905.01

Non-Metallic, Non-Shrink Mortar or Grout 905.13

Cold-applied joint sealer 907.02(B)

Reinforcement Bar Couplers 908.01(L)

Adhesive and Cast-In-Place Anchors 909.02(E)

Substructure Waterproofing 923.06(H)(1)

Substructure Membrane Waterproofing 923.06(H)(2)

Non-Shrink, High-Strength Mortar 905.14

Timber for Structures 910.01

Stainless Steel 909.01(C)

Stainless Steel Bolts, U-Bolts, J-Bolt, Nuts, and Washers 909.02(C)

Structural Steel 909.01

Grout 905.10

Concrete Penetrating Sealer 923.06(G)

Bag Mixes For Concrete Repairs 905.28

Materials required for spall repairs shall conform to Subsection 417.02.

For repair of concrete diaphragms, Class A high early strength concrete shall be used.

Repair Substructure Concrete shall be made using Class B air-entrained concrete.

When the total area to be repaired on a pier or abutment element is equal to or greater than 100 SF or 1 CY, the repairs shall be made using a 3/8” stone ready mix Class B concrete, packaged bag mix material will not be permitted. When the total area to be repaired on a pier or abutment is less than 100 SF or 1 CY, the use of packaged bag mix repair material conforming to 905.28 shall be permissible.

When Class A, High Early Strength Concrete is used for repairs, the temporary support shall not be removed until concrete sample cylinders have reached a compressive strength of 3,000 psi, but in no case less than 6 hours. When Class B concrete is used for repairs, the temporary support shall not be removed until after 14 days or until concrete sample cylinders have reached a compressive strength of 3,000 psi, but in no case less than 72 hours.

Touch-up of damaged epoxy coated reinforcement shall be made with anti-corrosion coating.

Jacks used for temporary support structure shall have a minimum rated capacity of one and a half the total dead load and live load indicated on the plans and as adjusted as necessary for the actual jacking point. Each jack shall have the maximum rated capacity clearly shown on the manufacturer’s nameplate attached to each jack. Jacks shall be equipped with pressure and height gauges that will enable the applied lifting forces and height of jacking to be monitored at all times. Any lifting equipment deemed by the Engineer to be inadequate or faulty may be directed to be replaced. Loads shown on the plans do not include construction loading.

Structural steel for jacking/supporting operations shall conform to Section 432.

418.05 Substructure Waterproofing

1. Substructure Waterproofing

Delete the fourth paragraph and replace it with the following:

Prior to application of the epoxy resin waterproofing, the perimeter of the steel masonry plate with the concrete substructure shall be sealed. The sealant shall comply with Subsection 923.28. The transverse edges of the sole plate at the interface with the bottom flange shall also be sealed using a sealant in accordance with Subsection 923.28. Silicone based sealants are typically not paintable – the order of construction operations shall be considered when choosing the material to be used.

1. Substructure Membrane Waterproofing

Delete the fifth paragraph and replace it with the following:

The perimeter of the steel masonry plates at the interfaces with the concrete substructure shall be sealed using a sealant in accordance with Subsection 923.28. The transverse edges of the sole plate at the interface with the bottom flange shall also be sealed using a sealant in accordance with Subsection 923.28. Silicone based sealants are typically not paintable – the order of construction operations shall be considered when choosing the material to be used.

418.07 Structural Steel Repairs

Delete the first paragraph and replace it with the following:

Replace Structural Steel Diaphragm provides for removal of existing deteriorated wide flange or channel section diaphragms and connection plates as required and replacement with new wide flange or channels in accordance with plan detail and at plan locations or where directed. The void created above the diaphragm and the concrete deck shall be injected with epoxy materials.

418.10 Measurement

Replace all instances of the phrase “field anti-corrosion coating” with “anti-corrosion coating”.

[Include the following for Contracts where rivets are to be replaced as a stand-alone item:]

Add the following language to the end of this Subsection:

**Replace Rivets with High Strength Bolts** shall be measured by each on an “if and where directed” basis.

418.11 Payment

Replace all instances of the phrase “field anti-corrosion coating” with “anti-corrosion coating”.

Replace the first paragraph with the following:

Quality acceptance for strength and durability for the various Portland cement concrete items listed above with an asterisk will be made in accordance with the specified Performance Criteria Category within Table 2 of Subsection 905.23.

[Include the following for Contracts where rivets are to be replaced as a stand-alone item:]

Add the following:

Payment will be made under:

***PAY ITEM PAY UNIT***

Replace Rivets with High Strength Bolts Each

Section 425 – Noise Barriers

425.02 Materials

Remove the following:

Adhesive Anchors 909.02(F)

Add the following:

Adhesive Anchors 909.02(E)

425.08 Measurement

The sixth paragraph is replaced with the following:

Caisson concrete, casing and tremie concrete, if used, will not be measured for payment.

425.09 Payment

The eighth paragraph is replaced with the following:

Quality acceptance for strength and durability of the foundation caisson concrete used to support the noise barrier posts will be made in accordance with the specified Performance Criteria Category within Table 2 of Subsection 905.23.

The following Section is replaced:

[Include the following in Contracts with MSE walls::]

Section 426 – Mechanically Stabilized Earth (MSE) Walls

426.01 Description

This work shall include the design and construction of Mechanically Stabilized Earth (MSE) wall structures composed of precast concrete facing panels, cast-in-place and/or precast parapets, moment slabs, copings, concrete leveling pads, soil reinforcement elements, joint materials, fasteners, Select Backfill, and all other appurtenant items of construction within the Common Structure Volume (CSV) as shown on the Plans, included as part of the selected MSE Wall System, or as specified herein.

This work shall also include MSE wall structures constructed in two-stages at specified locations. The primary stage shall consist of soil reinforcement elements and Select Backfill with a flexible facing which consists of welded wire and geosynthetics. The secondary stage shall consist of precast concrete facing panels and all other appurtenances as shown on the Plans. The sequence of construction shall be as shown on the Plans.

Design and construction of MSE walls shall be in accordance with the current editions of the AASHTO LRFD Bridge Design and Construction Specifications with Interims, except as noted otherwise herein. The design shall be in accordance with the current NJTA Design Manual and shall be signed and sealed by an engineer licensed in the State of New Jersey.

All labor, materials, equipment, and tools required to prepare the site, construct the leveling pad, construct the wall, place and compact the Select Backfill, and construct the coping and traffic barrier shall be supplied by the Contractor.

The following are defined for the allocation of responsibilities as described herein:

“Engineer” shall be defined in Paragraph 101.02B.

“Engineer of Record” shall be defined as the Professional Engineer licensed in NJ, responsible for the preparation of the Contract Documents.

“Wall Manufacturer” shall be defined as the MSE wall supplier/vendor and shall also include a Professional Engineer licensed in NJ, responsible for the preparation of the Working Drawings and calculations associated with the MSE Wall.

426.02 Materials

Materials shall conform to the following Sections and Subsections:

Portland Cement Concrete 905.05

Steel Reinforcing Elements 925.01

Geosynthetic Reinforcing Elements 925.02

Select Backfill for MSE Walls with Steel Reinforcing Elements 925.03

Select Backfill for MSE Walls with Geosynthetic Reinforcing Elements 925.04

High Density Polyethylene (HDPE) Geomembrane Liner System 925.05

Class 2 Geotextile Fabric 925.06

Filter Fabric 923.21

MSE Wall Systems 925.07

Precast concrete facing panels shall be Class P.

Materials shall conform to the current editions of AASHTO LRFD Bridge Design and Construction Specifications with Interims, modifications herein, and the provisions of the wall system selected for construction in the contract.

The Engineer of Record shall identify any unique conditions that may influence corrosion of metallic reinforcement including tidal, flood, shallow ground water, or stray electrical current and incorporate them into the Contract Documents. The Wall Manufacturer shall determine corrosion protection in accordance with site specific conditions, current AASHTO LRFD Bridge Design and construction Specifications, FHWA Geotechnical Engineering Circular No. 11, and FHWA Corrosion/Degradation of Soil Reinforcements for Mechanically Stabilized Earth Walls and Reinforce Soil Slopes considering the potential for aggressive corrosion potential from these unique conditions identified.

Where aggressive corrosion conditions are encountered, the use of soil reinforcements fabricated from stainless steel Grade 316L may be considered provided all connections are composed of like metals, or alternatively are fabricated from a combination of galvanization and sacrificial streel adequate to provide the required service life.  In such a case, design corrosion rates shall be submitted by the Wall Manufacturer for review and approval at the sole discretion of the Engineer of Record and final concurrence of the Authority.

The Wall Manufacturer shall make recommendations regarding the corrosion rates that shall provide the required 75- or 100-year service life. Galvanization shall be considered an acceptable form of metallic protection if in accordance with AASHTO LRFD Bridge Design Specifications. Aluminized and epoxy type coatings shall not be considered as an acceptable form of corrosion protection and shall not be approved for use. The Contractor shall furnish all metallic wall system components including, but not limited to steel straps, coil rods, coil loops, hairpin clips, with the same type of corrosion protection. Corrosion protection shall be galvanized unless otherwise approved by the Authority.

The Contractor shall place connections between the wire facing and precast concrete panels 4 inches or more from reinforcing steel in the precast concrete panels, to reduce the viability of macrocell corrosion. The Contractor shall coat connections between wire facings and precast concrete panels with a non-conductive bonding agent applied on all surfaces in contact with the precast concrete panels and fill between the wire facing and precast concrete panels. The non-conductive bonding agent shall have a resistivity of 50,000 ohm-cm or more and be applied at the maximum thickness recommended by the manufacturer.

The use of Geosynthetic Reinforcing will only be allowed where specified on the plans.

If geosynthetic reinforcement is connected to wall panels with metallic connection components, both the geosynthetic and metallic materials must be evaluated for electrochemical conditions of their respective material types and the Select Backfill material must satisfy the requirements of both 925.03 and 925.05 to ensure electrochemical compatibility.

Select Backfill conforming to the requirements herein shall be used within the CSV as shown on the Plans and specified in Subsection 925.03 and/or 925.04 and may be procured from off-site sources or from on-site borrow excavation.

Except as may be modified within this Section, all applicable provisions of Sections 400 and 900 shall apply in furnishing and installing MSE Wall Systems.

Levelling pads shall conform to the requirements of the Wall Manufacturer.

The Contractor shall make their own arrangements to purchase the materials and services from one of the Wall Manufacturers. Selection of only one (1) wall system, type and material of soil reinforcing element and connection element will be permitted per Project. No more than one (1) Wall Manufacturer will be permitted for use on the Contract.

An on-site technical representative from the selected Wall Manufacturer shall be present to assist and instruct during the installation of the first two-panel courses of the first wall in the contract, as a minimum.

426.03 Methods of Construction

1. General

Methods of construction shall conform to the current editions of AASHTO LRFD Bridge Design Specifications with Interims and AASHTO LRFD Bridge Construction Specifications with Interims, modifications herein and the provisions of the permitted wall system selected for construction in the contract.

Clearing, grubbing, and excavation shall be performed in accordance with Division 200, and as required by the Plans. If poor subgrade conditions are encountered in the opinion of the Engineer, the Engineer of Record shall be notified prior to the continuation of wall construction.

Each shipment of wall components shall be clearly marked with the Wall Manufacturer’s name and batch identification. The Contractor shall provide an on-site storage area from time of delivery until installation. The Contractor shall protect all wall components from dirt, water and other sources of damage. Reinforcing elements shall be protected from cutting, distortion, or other damaging conditions during loading, transportation and unloading at the site.

Leveling pads shall be surveyed following installation prior to setting the first course of panels, and the results shall be submitted to the Engineer.

Reinforced wall fill placement shall closely follow erection of each course of facing panels. Select Backfill shall be placed in such a manner to avoid damage or disturbance of the wall materials, misalignment of facing panels, or damage to soil reinforcement or facing members. The Contractor shall place backfill to the level of the connection and in such a manner as to ensure that no voids exist directly beneath reinforcing elements.

Select Backfill shall be placed in maximum 12” thick loose lifts. Select Backfill shall be compacted to a minimum of 95% of the maximum dry density as determined by AASHTO T99 (Standard Proctor) or greater if specified by the Wall Manufacturer. The in-place compacted dry density of the Select Backfill shall be tested in accordance with AASHTO T310 Method B. In-place field density testing should be performed every 500 feet linearly after each succession of placement of lifts totaling 3 feet vertically. If the wall is less than 500 feet long, a minimum of two locations shall be tested per wall after each succession of placement of lifts totaling 3 feet vertically. Additional testing may be performed if deemed necessary by the Engineer. If greater than 30 percent of Select Backfill is retained on the ¾” sieve, laboratory Standard Proctor (AASHTO T99) and field density testing (AASHTO T310) is not required, and satisfactory compaction shall be considered less than 0.25” of displacement during the last pass of the compacting equipment, provided the lift thickness requirements specified herein are satisfied. The optimum Select Backfill moisture content to achieve minimum required compacted soil density shall be as determined by AASHTO T99.

The specified compaction of the Select Backfill shall be accomplished by use of large, smooth drum, vibratory rollers with the exception of the 5-foot zone directly behind the facing panels.

Within the 5-foot zone directly behind the facing panels, small, single or double drum, hand operated, walk-behind vibratory rollers, or walk-behind vibrating plate compactors shall be used, and at least three passes shall be made.

The compaction equipment shall be capable of providing uniform density throughout the depth of the layer of the Select Backfill being compacted with no disturbance to the vertical or horizontal alignment of the previously placed panels.

If there is evidence of wall displacement or disturbance, compaction shall be stopped and an alternate method shall be implemented, which does not impact the wall.

Select Backfill material that is composed primarily of gravel with less than 40 percent passing the ¾ inch sieve shall be separated by a Class 2 Geotextile Fabric, as defined in Subsection 925.06, to within 3 feet below the wall coping. Adjoining sections of geotextile fabric shall be overlapped by a minimum of 12 inches.

At MSE wall locations where post construction settlement is expected but no ground improvement is specified, placement of the pavement box, barrier parapet, coping, moment slab or approach slab shall not begin until the anticipated additional post construction settlement is less than one inch.  The Engineer will evaluate the actual settlement based on field instrumentation data to verify the diminished rate of settlement and the projected settlement remaining.  The Engineer will be the sole judge to determine that the anticipated additional post construction settlement is less than one inch.  Construction of the pavement box shall only be performed upon written authorization from the Engineer.

At two-stage MSE wall locations, placement of second stage shall not begin until and the anticipated additional post construction settlement is less than one inch. The Engineer will evaluate the actual settlement based on field instrumentation data to verify the projected settlement remaining.  The Engineer will be the sole judge to determine t that the anticipated additional post construction settlement is less than one inch.  Construction of the second stage shall only be performed upon written authorization from the Engineer.

For one or two stage MSE walls, ensure that the wall coping system will accommodate any construction or post construction settlement, without requiring cutting of the precast panels or units. The uppermost soil reinforcing element shall be located so as to not interfere with the coping and/or moment slab after a minimum anticipated settlement of 1 inch has taken place.

Wall materials damaged during backfill placement shall be removed and replaced by the Contractor, at no additional cost to the Authority. The Contractor may submit alternative corrective procedures to the Engineer for consideration. Proposed alternative corrective procedures shall have the concurrence of the Wall Manufacturer and Engineer of Record, in writing, prior to the acceptance by the Engineer.

1. Construction Methods Specific to Steel Reinforced MSE Walls

Soil reinforcement shall be uniformly tensioned to remove any slack in the connections to the facing panels. Where an individual soil reinforcement element has multiple connections to a facing panel, a minimum of two connections per layer per panel shall be in full contact upon tensioning the element, with maximum gaps of 1/16 inch at remaining connections.

Repairing scratches or other imperfections in corrosion protection on steel reinforcing elements shall be performed in accordance with Section 925 and the manufacturer’s recommendations.

Select Backfill shall be spread by moving the machinery parallel to or away from the wall facing and in such a manner that the steel reinforcement remains normal to the face of the wall or at the specified angle. Construction equipment shall not operate directly on the reinforcement. A minimum fill thickness of three (3) inches over the steel reinforcement shall be required prior to operation of vehicles. Sudden braking and sharp turning shall be avoided.

1. Construction Methods Specific to Geosynthetic Reinforced MSE Walls

Geosynthetic reinforcement shall be stored in conditions above 20ºF and not greater than 140ºF. Geosynthetic reinforcement shall be covered and protected from sunlight prior to placement in the wall system.

Geosynthetic reinforcement shall not be unwrapped until just before installation Geosynthetic reinforcement shall not be left exposed for more than 1 day before covering, except when installed for erosion control devices, two stage walls, and temporary faces, where exposed in-place geotextile is planned.

Geosynthetic Reinforcement shall be held in place with wire staples or anchor pins to remain taught while placing Select Backfill. Steel anchor pins with a diameter of at least 3/16" and a length of at least 18" with a point at one end and a head at the other end that will retain a steel washer with an outside diameter of at least 1.5" or as per manufacturer’s recommendations shall be used.

Geosynthetic Reinforcement shall be installed in accordance with the manufacturer’s working drawings. Geosynthetic Reinforcement shall be placed in continuous longitudinal rolls perpendicular to the wall. Joints parallel to the wall shall not be permitted.

Geosynthetic Reinforcement coverage shall be continuous at each reinforcement elevation or as shown in the Working Drawings. Adjacent panels of Geosynthetic Reinforcement need not be overlapped, except when exposed in a wrap-around face system, at which time the adjacent reinforcement panels shall be overlapped or mechanically connected per the manufacturer’s requirements.

During construction, the surface of the reinforced fill shall be kept horizontal. Geosynthetic Reinforcement shall be placed directly on the compacted horizontal fill surface. The reinforcement shall bear uniformly on the compacted reinforced soil from the facing connection to the free end of the reinforcing elements. The reinforcement placement elevation shall be at the connection elevation to two (2) inches higher than the connection elevation.

The Select Backfill shall be spread by moving the machinery parallel to or away from the wall facing and in such a manner that the Geosynthetic Reinforcement remains taut. Construction equipment shall not operate directly on the Geosynthetic Reinforcement. A minimum fill thickness of six (6) inches over the Geosynthetic Reinforcement shall be required prior to operation of vehicles. Sudden braking and sharp turning shall be avoided.

1. Precast Panel Unit Production/Tolerances

All units shall be manufactured within the following tolerances:

1. All dimensions shall be within 1/4 inch.
2. Location of panel connection devices shall be within 1 inch.
3. Squareness as determined by the difference between the two diagonals shall not exceed 1/2 inch
4. Surface defects on smooth and textured formed surfaces measured over a length of 5 feet shall not exceed 1/4 inch and 5/16 inch, respectively.

Units shall be rejected because of failure to meet any of the requirements specified above. In addition, any or all of the following defects, as assessed by the Engineer, shall be sufficient cause for rejection:

1. Defects that indicate imperfect molding.
2. Defects indicating honeycombed or open texture concrete.
3. Defects in the physical characteristics of the concrete units, such as:
4. Stained front face due to excess form oil or other reasons.
5. Signs of aggregate segregation.
6. Broken or cracked corners.
7. Tie strips bent or damaged.
8. Lifting inserts not usable.
9. Exposed reinforcing steel.
10. Cracks at the PVC pipe or pin.
11. Insufficient concrete compressive strength.
12. Deviation from flatness of exposed surface in excess of 1/8 inch per 5 feet

An additional inspection shall be made prior to erection to determine any damage which may have occurred during storage.

The Engineer will determine whether spalled, honeycombed, chipped, or otherwise defective concrete shall be repaired or be rejected. Repair of concrete, if allowed, shall be done in a manner satisfactory to the Engineer at no additional cost to the Authority.

Repair to concrete surfaces which will be exposed to view after completion or construction shall be approved by the Engineer.

1. Wall Construction/Tolerances

Finished MSE walls shall be erected within the following tolerances:

The overall vertical alignment tolerance, or plumbness, from top to bottom of the structure, shall not exceed 1/2 inch per 10 foot of wall height.

Deviation from horizontal alignment shall not exceed ¾ inch.

Vertical and horizontal alignment tolerance, or plumbness, shall not exceed ¾ inch when measured with a 10-foot straight edge on a selected wall section.

1. High Density Polyethylene (HDPE) Geomembrane Construction

Where an MSE wall is constructed supporting a roadway that will be subjected to chemical deicing, installation of a High Density Polyethylene (HDPE) geomembrane liner system, as shown on the Plans and specified in this Section 925.05 shall be included. All labor, materials, transportation, handling, storage, supervision, tools and other equipment that may be necessary to install and test the HDPE liner system shall be included.

Before liner installation, the area that is to be lined shall be smooth and free of sharp objects or debris of any kind. Atmospheric exposure of geomembrane to the elements following lay down shall be a maximum of fourteen (14) days. The Contractor shall install HDPE geomembrane liner free of holes and tears.

The HDPE shall be placed below the pavement, above the first row of reinforcement, over the parapet moment slab (where present), and over specified areas as shown on the plans. The HDPE shall be sloped to drain away from the facing panels.

HDPE shall not be installed during periods of precipitation or in conditions of excessive moisture such as fog or dew. The HDPE liner shall be placed in accordance with the HDPE manufacturer’s recommendations and as approved by the Engineer.

All seams of the HDPE geo-membrane liner system shall be, as per the manufacturer’s specifications, sealed or overlapped to prevent leakage. Seams shall be oriented parallel to the line of maximum slope. Seams shall have a minimum finished overlap of 4 inches, unless a greater overlap is specified by the HDPE manufacturer.

Field testing of seams, according to the manufacturer’s specifications, shall be conducted to verify satisfactory seaming conditions.

When backfilling, care shall be taken to prevent damage to the HDPE liner system. Any tears, punctures or holes incurred during the installation process shall be assessed by the Engineer and the membrane shall either be repaired in accordance with recommendations of the membrane manufacturer or replaced at the Engineer’s discretion at no additional cost to the Authority.

Perforations through the liner shall be limited. Where penetrations are necessary, the Contractor shall provide details demonstrating the method(s) of sealing the penetration for approval by the Engineer.

1. Construction Stormwater Management

At the end of each construction period, the Contractor shall slope the last placed layer of backfill away from the wall facing to direct runoff or rainwater away from the wall face. Surface runoff shall not be allowed to enter the wall construction site from adjacent areas.

The maximum allowable offset between any two panels shall not exceed ¾ inch.

426.04 Working Drawings

Working Drawings shall be prepared and submitted in accordance with the requirements specified under Subsection 104.08. The CSV shown on the Plans is anticipated to envelop the majority of potential wall system reinforced earth volume requirements. However, should the limits of structure volume for the proposed wall system extend beyond the limits of the CSV, the wall system shall be submitted as a Substitution in accordance with this specification. The Substitution must be approved by the Engineer prior to submitting Working Drawings. At a minimum, Working Drawings shall include the following:

1. Design calculations signed and sealed by a Professional Engineer licensed in the State of New Jersey, in conformance with current edition of AASHTO LRFD Bridge Design and Construction Specifications with Interims and modifications herein and the provisions of the approved wall system selected for construction in the contract. MSE walls shall be designed for a minimum 75-year design life. MSE walls which support embankments under bridge abutments shall be designed for a 100-year design life. All MSE wall components shall be designed for the 100-year flood elevation. Walls shall be designed for rapid drawdown conditions to account for the differences in hydrostatic pressure for a 100-year design flood; and/or rapid draining embankment material can be used as Select Backfill. Walls shall be designed for the extreme event limit state for seismic if required by AASHTO LRFD Bridge Design Specifications.

Load Factor Design (LFD) methodology shall be used for the Internal Strength and Stability for Barrier Parapet and Moment Slab System. Allowable Stress Design (ASD) methodology shall be used for External Stability for Moment Slab.

External stability of the wall including bearing capacity, settlement, global stability, and surface and subsurface drainage shall be the responsibility of the Engineer of Record.

Internal stability including but not limited to reinforcement tensile resistance, reinforcement pull-out resistance, reinforcement long term durability (i.e. corrosion, creep, and degradation from ultraviolet radiation connection details, coping, and moment slab will be the responsibility of the Wall Manufacturer’s Professional Engineer Licensed in NJ preparing the Working Drawings.

Any out of tolerance joint spacing, wall plumbness, or other deformation of the wall will be the responsibility of the Contractor, unless the Contractor can adequately document with survey results that settlement occurred and the deformation was not a result of the construction means and methods to the satisfaction of the Engineer.

If the Wall Manufacturer preparing the Working Drawings elects to modify the unit weight and friction angle of the Select Backfill material, the Engineer will be notified to verify with the Engineer of Record that the changes will not impact the wall’s external stability. These modifications shall only be allowed with the approval of the Engineer of Record.

1. General notes shall address design parameters, Select Backfill parameters, type of reinforcing elements, factors of safety and/or load and resistance factors and any Project specific requirements related to construction.
2. An elevation view of the wall showing:
   * 1. Elevations along the top of the wall, at beginning and end of wall, at 25-foot intervals, at changes in grade, at changes in Common Structure Volume (CSV) limits; and at precast panel unit joints where indicative of wall geometry.
     2. Elevations and step locations for leveling pads and/or footings.
     3. The location of the final ground line.
     4. Number and type of precast panel units.
     5. A numbered panel layout for fabrication and erection purposes.
     6. Designation of breaks in vertical alignments and elevations.
     7. Locations and elevations/inverts of any utilities or drainage which passes through/below the retaining wall or the Common Structure Volume.
3. A plan view of the wall showing:
   * 1. The offset from the construction baseline to the face of precast wall units at all changes in horizontal alignment.
     2. Right-of-Way (ROW) limits and their relationship to the wall with offsets and stations to wall corners and ends.
     3. Locations of piles, drilled shafts, noise walls, sign structures, or other appurtenant items which are supported by the wall or its parapet/coping.
     4. Locations and alignments of any utilities or drainage which passes through/below the retaining wall or the CSV.
     5. The offset from the construction baseline to limits of CSV at all changes in horizontal alignment and offsets of CSV limits.
4. Typical sections of wall showing:
   * 1. Limits of cut and fill work.
     2. Limits of Select Backfill, retained backfill behind the CSV, and surface and subsurface drainage materials.
     3. Limits of CSV and associated appurtenant items such as surface and subsurface drainage features and soil reinforcing elements.
     4. Location of final ground lines.
5. Precast panel unit details for all panel types, including non-standard panels, with all dimensions necessary to construct the panels with locations in the member of all appurtenant items such as reinforcement steel, reinforcing element connection points, and lifting devices. In the case of two-stage construction, flexible facing details, connectors between first and second stage construction, precast panel units, fill type between flexible facing and precast panel units, and other pertinent details.
6. Details for footings, leveling pads and footing or leveling pad step details, where required.
7. Details for precast barriers, copings, connections to all appurtenant items such as railings, fences, lighting standards, and noise barriers.
8. Details for wall construction and soil reinforcing element placement to accommodate any obstructions such as piles, drilled shafts, utilities, acute corners, slip joints, highway lighting systems, drainage structures and any other obstructions.
9. Details for any cast in place elements with all dimensions necessary to construct the elements with locations in the member of all appurtenant items such as reinforcement steel.
10. Detail for any architectural treatments such as facing finish, texture, and color.
11. The Wall Manufacturer's working drawings including sequence of construction.

426.05 Substitutions

Wherever requirements for wall components, proprietary components, or methods of construction are specified, it is intended to establish a standard of quality and shall not be interpreted to preclude substitutions by Contractors, subject to conditions given hereinafter.

Substitution will be considered when such proposed substitution equals or exceeds that specified with respect to quality, workmanship, service, maintenance, economy, reliability of operation, code compliance, and aesthetics.

When the Contractor requests substitution, they shall first thoroughly investigate its proposed substitution and certify to the Engineer, in writing, that said proposed substitution is equal to that specified. The Contractor shall include with said certification all required data, samples, reports and tests to substantiate its findings. The Engineer will decide if such substitution is equal to that specified; and if found to be so, may then approve the substitution. The Engineer's decision will be final and binding to all parties.

Where proposed substitution requires modifications to the CSV shown on the Plans or the selected wall system extends beyond the limits of the CSV shown on the Plans, the Contractor shall quantify all impacts and adjustments to affected item quantities such as but not limited to excavation, backfill, and sheeting and the Project schedule as a part of its substitution request. Additional costs which arise from quantity or schedule impacts of the substitution shall be borne solely by the Contractor. Approval of the disposition of the pay limits and quantities to accommodate the substitution shall be integral to the approval of the substitution.

Approved substitutions shall be at no additional cost to the Authority. Rejection of a requested substitution shall not be considered as a basis for a claim against the Authority, including claims of delay of time and loss of money.

426.06 Measurement

1. Mechanically Stabilized Earth Walls will be measured by the total square feet of wall panel area supplied and constructed in the completed wall. The area measured will be the product of the average vertical height between final rear face and front face ground lines and the total lengths of the wall as given on the Plans. Within the CSV or except as may otherwise be provided for, no quantity other than the square foot wall area as defined above will be measured for payment.
2. Common Structure Volume (CSV)

The CSV is the volume that contains all components of all retaining wall systems considered for construction at a given site. The limits of the CSV are defined as:

End Limit Planes: Vertical planes, normal or radial to the wall alignment, at begin and end stations of the wall system.

Forward Limit Plane: Vertical plane(s) two feet or other designated distance shown on the Plans forward of the fascia. The fascia is defined as the forward limit of wall coping or barrier parapet face, wall panel or unit face or other physical feature as shown on the plans

Rear Limit Plane: Vertical plane(s) at the rear limits of the Select Backfill. For the purposes of defining the CSV, this limit will be located parallel to the Forward Limit Plane and at minimum distance of 70% of the average vertical dimension between the Bottom Limit Plane and the Top Limit Plane, plus one (1) foot and will include any porous fill, all wall appurtenances such as drainage systems, pertinent retained fill and any work to be included in the wall pay item.

Bottom Limit Plane: Horizontal Plane(s) at the lower elevations of the wall to include the leveling pad(s)/footing(s), the undersides of the Select Backfill or modular units and excavations required for the construction of the Select Backfill or modular units, extending between the Forward and Rear Limit Planes of the CSV.

Top Limit Plane: Plane(s) defining the configuration (slope, roadway, pavement box, etc.) at the top of the wall extending between the forward and rear limits of the CSV. Where finished grade of an MSE wall is defined by a pavement system, the CSV Top Limit Plane shall be defined as the underside of the pavement system subgrade material as noted in the Plans.

Unless otherwise noted in the Plans or Specifications, all components of the wall system and all components, elements or appurtenances , such as copings, parapets, barriers, moment slabs, wall underdrains, geo-membrane liner systems, etc., founded on or located within the CSV or attached to any component of the wall system within the CSV shall be included in the MSE wall.

426.07 Payment

Payment will be made under:

PAY ITEM PAY UNIT

Mechanically Stabilized Earth Walls Square Foot

No additional payment will be made for Substitutions under Subsection 426.05.

No additional payment will be made for costs resulting from submission, approval or rejection of Substitutions under Subsection 426.05.

Payment for electrical items will be made in accordance with Division 600, unless otherwise noted on the Plans.

[Include the following in Contracts with Prefabricated Modular walls::]

Section 427 – Prefabricated Modular (PM) Walls

427.02 Materials

Add the following to the list of materials after the second paragraph:

Prefabricated Modular Walls 923.48

1. **Prefabricated Modular Wall Systems**

Delete the entire Paragraph and replace with the following:

The Contractor shall make their own arrangements to purchase the materials and services from one of the Authority’s approved Wall Manufacturers. Selection of only one (1) PM Wall System and no more than one (1) Wall Manufacturer will be permitted for use on the Contract.

An on-site technical representative from the selected Wall Manufacturer shall be present to assist and instruct during the installation of the first two-module courses of the first wall in the Contract, as a minimum.

[Include the following with new bridge construction or deck construction Contracts:]

Section 428 – High Performance Concrete (HPC)

428.05 HPC Acceptance Requirements

Replace Paragraph (C) with the following:

1. For quality acceptance limits, testing and sampling, see Subsections 905.21, 905.22 and 905.23.

Section 429 – Drilled Shafts

**429.04 Installation of Drilled Shafts**

1. **Field Quality Controls**
2. Inspection

Delete item (d) and replace it with the following:

All SID tests shall be recorded on an .mp4 file with audio commentary by the Engineer, identifying the shaft being tested, the test location within the shaft, and the percent of view with sediment thickness greater than ½ inch and 1 ½ inch. Recordings shall be provided to the Authority upon completion of drilled shaft installation.

[Include the following as necessary:]

Section 430 – Self-Consolidating Concrete (SCC) for Drilled Shafts

430.04 Verification of Pumpability

Replace the third paragraph with the following:

The mix shall be approved based on the criteria provided in Table 1 above.

The following Section is added:

Section 436 - Alkali-Silica Reactivity (ASR) Treatment

436.01 Description

This work shall consist of the installation and monitoring of an electrochemical treatment to impregnate lithium salts into concrete suffering from Alkali-Silica Reactivity (ASR) at the pile cap/footings at Structure No. [insert number]. This electrochemical treatment is performed by applying an electrical field between the reinforcement and discreet anodes placed in reservoirs in the concrete. Also included is the power supply and maintenance, and the chain link fence around the site.

The installation and monitoring of this electrochemical treatment will be done by Vector Construction, Inc., a specialty Contractor, from Winnipeg, Manitoba, Canada.

436.02 Materials

Materials used for the electrochemical treatment system are in the specifications by Vector Construction, Inc. included in Appendix [insert Appendix letter].

436.03 Pile Cap/Footing Preparation

Prior to the installation of the electrochemical treatment system by Vector Construction, Inc., the Contractor shall repair all spalls and seal all cracks in accordance with Subsections 418.03 and 418.05. Spalls should be repaired with Class B concrete or cementitious spall repair materials in accordance with Subsections 905.13 and 905.14. Cracks shall be sealed with repair materials in accordance with Subsection 923.29.

436.04 Methods of Construction

The installation procedure for the electrochemical treatment system is outlined in the specifications by Vector included in Appendix [insert Appendix letter].

The system operation and maintenance, termination of electrochemical treatment and dismantle and disposal of the system is also included in the specifications by Vector in Appendix [insert Appendix letter].

436.05 Measurement

Repair Concrete Footing, Structure No. \_\_\_\_\_\_\_\_\_ will be measured by the number of pile cap/footings to receive the electrochemical treatment.

436.06 Payment

Payment will be made under:

PAY ITEM PAY UNIT

Repair Concrete Footing, Structure No. \_\_\_\_\_\_\_\_ Each

Payment for Repair Concrete Footing, Structure No. \_\_\_\_\_\_\_\_\_ will be for the installation and monitoring of the electrochemical treatment system, power supply and maintenance, and the chain link fence around the site including all costs for labor, materials equipment, handling and storage of materials, and all else necessary therefore and incidental thereto.

Payment for excavation around the pile cap/footings to expose the top and vertical faces of the pile cap/footings in preparation of the installation of the treatment system will be included in the price bid for item Pier Footing Excavation, Structure No. \_\_\_\_\_\_\_\_\_\_.

Payment for removal of water at the pile cap/footing excavations, if required, will be included in the price bid for item Pier Footing Excavation, Structure No. \_\_\_\_\_\_\_\_\_.

Payment for spall repairs required at the pile cap/footings prior to the installation of the electrochemical treatment will be included in the price bid for item Repair Spalled Concrete, Type 1-Pier.

The Contract includes No-Bid Item No. 37 "Repair Concrete Footing, Structure No. \_\_\_\_\_\_ with the fixed unit price cost of **[insert cost]** for each footing. The unit price and bid amount has been included in the proposal.

Payment for sealing cracks required at the pile cap/footings prior to the installation of the electrochemical treatment will be included in the price bid for items Cementitious Grout Injection – Footings.

[Include the following as necessary:]

The following Section is added:

Section 437 - Post Tensioning of Pier Caps

437.01 Description

This work shall consist of the installation of post tensioning threadbars on existing pier caps for Structure No. [insert number] and [insert number] pier caps for Structure No. [insert number] of the [insert Roadway] over the [insert location], including a double corrosion protection system, drilling holes and grouting.

437.02 Materials

1. Post Tensioning Rods

Post Tensioning Rods shall be 1¾" diameter post tensioning steel threadbar rods, Grade 150Ksi conforming to ASTM Designation A-722, hot-rolled and proof-stressed, as manufactured by Dywidag-Systems International, USA, Inc., or Williams Form Engineering Corporation. Each bar shall be factory proof-stressed after the threading operation to a minimum of 80% of the guaranteed minimum tensile strength.

1. Plastic Sheathing

Post Tensioning Rods shall be 1¾" diameter post tensioning steel threadbar rods, Grade 150Ksi conforming to ASTM Designation A-722, hot-rolled and proof-stressed, as manufactured by Dywidag-Systems International, USA, Inc., or Williams Form Engineering Corporation. Each bar shall be factory proof-stressed after the threading operation to a minimum of 80% of the guaranteed minimum tensile strength.

1. Structural Steel

Structural Steel bearing plates shall conform to ASTM A709, Grade 50. Nuts shall be hexagonal, heavy-duty type with round head, conforming to ASTM A-325 or the bar manufacturer’s specifications. All hardware shall be hot-dipped galvanized in accordance with the Standard Specifications.

1. Cement Grout

Cement Grout for grouting rods shall be neat cement, with a water-cement ratio of 0.45 by weight. An approved additive shall be mixed with the grout as an expanding agent. The cement grout shall have sufficient strength to guarantee the load transfer between the threaded bar and the corrugated sheathing.

1. Grease

Grease for the stressing head assembly shall be a mastic corrosion inhibitor, waterproof, non-corrosive, non-hardening sealing compound.

1. Epoxy Coating

Epoxy Coating shall conform to ASTM A-775.

437.03 Methods of Construction

The holes shall be drilled to the diameter, depth, line, and tolerances specified on the Contract Drawings.

All holes through the pier cap for attaching the side plate assemblies shall be core drilled. The minimum diameter of the core drilled holes shall be as shown on the plans or as specified by the bar manufacturer, and approved by the Engineer. In addition, the Contractor may design and detail a temporary support for the installation of the post tensioning system, using anchors drilled and grouted into the existing pier, subject to the approval of the Engineer.

After installation, the exposed ends of the post tensioning rods shall be cleaned of rust and immediately field epoxy coated. End caps shall be installed in accordance with the manufacturer’s recommendations.

A qualified representative of the manufacturer shall supervise the installation and tensioning of the rods stressed at the first pier to be post tensioned.

437.04 Measurement

The post tensioning of pier caps will be measured by the actual number of pier caps repaired.

Cleaning and field epoxy coating of post tensioning rod ends will not be measured for payment, but the cost thereof shall be included in the price for each individual Post Tensioning - Pier Cap.

437.05 Payment

Payment will be made under:

PAY ITEM PAY UNIT

Post Tensioning – Pier Cap Each

[Include the following as necessary:]

The following Section is added:

Section 438 - Structural Steel Repairs, Structure No. [Insert Number]

438.01 Description

This work includes repair of deteriorated structural steel at the south end of Girder [insert girder number], at the [insert abutment location] abutment. The work will be completed concurrently with the repair of the existing rocker bearing at [insert girder number]at the south abutment in conformance with Section 418. This work shall also include painting in conformance with Section 411.

438.02 Materials

Steel repair materials shall conform to Subsections 403.02 and 418.02.

438.03 Repair of Structural Steel

1. Jacking of Superstructure

To complete the repairs as shown on the plans, jacking of the superstructure is required for straightening of the bottom flange of the girder and to repair the existing bearing. Due to the deflected position of the bottom flange, jacking at Girder [insert girder number] to a total height of ½ inch will be required to remove the bearing. This height will be attained by jacking Girder [insert girder number] and Girder [insert girder number] progressively as follows:

* The bolted crossframe connections between Girders [insert girder number] and [insert girder number] shall be loosened to a “hand tight” condition to prevent damaging the frames during jacking.
* Jack Girder [insert girder number] to [insert height] inch and install blocking.
* Jack Girder [insert girder number] to [insert height] inch and install blocking.
* Jack Girder [insert girder number] an additional [insert height] inch to a total height of [insert height] inch and install blocking under the undamaged portion of the bottom flange as indicated in Part (B) below.

Lowering of the girders shall be completed using a sequence in reverse of the raising procedure shown above.

Jacking will be completed from jacking posts founded on the abutment footing or by other means approved by the Engineer. Jacking from the abutment footing will require removal and replacement of the existing concrete slope protection as follows:

* Sawcut a rectangular area, approximately 2’ x 3’, 1 inch deep, in the concrete slope protection adjacent to the abutment breastwall below the girder.
* Remove concrete within the sawcut area (up to the breastwall face) using a maximum 30-pound hammer.
* Excavate the exposed fill material directly below the area of concrete removal until the abutment footing is exposed.
* Provide timber sheeting and walers, or other means approved by the Engineer to support the excavation.
* Place jacking post with base plate and jack plate on footing and jack girders as described earlier. Complete the proposed repairs.
* At completion of the work, remove jack post, sheeting, etc. Backfill the excavation with removed materials or suitable backfill material approved by the Engineer. Compact the fill to 95% proctor density.
* Repair the Concrete Slope Protection with Class B concrete reinforced 1 inch from the bottom with 6” x 6” epoxy coated welded wire mesh. Concrete shall be placed to meet the elevation of the existing slope protection. The concrete shall be worked to fill all voids that may have developed beneath the slope protection that was not removed surrounding the excavation. The color of the slope protection patch material shall match that of the existing slope protection concrete and shall have a matching finish.

1. Steel Repair Procedure

Steel repairs at Girder [insert girder number] shall be completed in accordance with the following procedure or as otherwise approved by the Engineer:

* Jack and block the girders as per the method described above and as per the details.
* Cut the sole plate welds and remove the sole plate, keeper plates and the rocker bearing.
* The rocker bearing shall be repaired under the item “Repair Bearing, Rocker-Abutment.”
* Remove the load from the jack and allow the load to bear fully on the blocking.
* Place the flange jack and jack plate under the deviated portion of the lower flange near the end of the girder. The jack and jack plate shall be centered under the detached flange section.
* Jack the detached section of the lower flange until it is straightened and meets the profile alignment of the remaining length of the lower flange. Provide blocking under the jack plate. Release the load from the flange jack and remove it.
* Proceed with steel repairs as shown on the plans. Cleaning and sandblasting of steel surfaces shall be completed prior to making the repairs and again after repairs are complete.
* After all repairs are complete, the girder shall be jacked from the jacking post, blocking shall be removed and the bearing shall be reinstalled. The jack shall be lowered and the bearing shall be welded in place.
* Painting shall be completed after removal of all jacks and blocking.

1. Repair of Structural Steel

Repair of structural steel provides for the straightening of the bottom flange, cleaning and painting the existing deteriorated girder and installing repair plates in accordance with the details shown on the plans or as directed by the Engineer. Materials and workmanship shall conform to the applicable provisions of Sections 403 and 411. All structural steel repairs and girder modification shall be painted in accordance with Section 913.

Repair of Structural Steel, Type A provides for repair of holes and section loss in the web of a girder at the locations shown on the plans and as directed by the Engineer. The Contractor shall clean the structural steel at the specific locations shown to determine the extent of the repairs required and the exact dimensions of the repair plates prior to fabrication. Repairs shall then be constructed as shown on the plans and approved shop drawings.

Repair of Structural Steel, Type B and Repair of Structural Steel, Type C provides for repair of holes and section loss in the bearing stiffener and web stiffener of a girder at the locations shown on the plans and as directed by the Engineer. The Contractor shall clean the structural steel at the specific locations shown to determine the extent of the repairs required and the exact dimensions of the repair plates prior to fabrication. Repairs shall then be constructed as shown on the plans and the approved shop drawings.

438.04 Measurement

Steel Repair, Structure No. [Insert No.] shall not be measured, and payment will be made on a lump sum basis.

438.05 Payment

Payment will be made under:

PAY ITEM PAY UNIT

Steel Repair, Structure No. [Insert No.] Lump Sum

Separate payment will be made for the repair of the rocker bearing under the item Repair Bearing, Rocker – Abutment in accordance with Section 418.

[Include the following as necessary:]

The following Section is added:

Section 439-Vertical Realignment Of Deck Joint At Structure   
No. [Insert Number]

439.01 Description

This work includes the jacking of stringers and installation of shim plates to adjust the opposing tooth joint elevations at Pier [Insert No.] to within a ⅛ inch vertical tolerance. This work also includes the grinding of the tooth joint plates to meet the ⅛ inch vertical tolerance where this accuracy cannot be achieved by shimming the stringers.

439.02 Materials

Repair materials shall conform to Subsections 403.02 and 418.02.

439.03 Equipment

Jacks shall be selected to provide the required height extension and collapsed height to meet the required space limitations between the end floor beam and the stringers. The following jacks meet these requirements:

* Stringers [insert stringer number(s)]

ENERPACMilwaukee, WI, 1-800-558-0530; Model RSM – 300 Capacity: 50 Tons, Height: 2 ⅝ inches, Stroke: ⅝ inch.

* Stringers [insert stringer number(s)]

ENERPACMilwaukee, WI, 1-800-558-0530; Model RSM – 300 Capacity: 50 Tons, Height: 2 ⅝ inches, Stroke: ⅝ inch.

* Stringers [insert stringer number(s)]

ENERPACMilwaukee, WI, 1-800-558-0530; Model RCS – 302 Capacity: 30 Tons, Height: 4 ⅝ inches, Stroke: 2 7/16 inches.

439.04 Method Of Construction

1. Field Measurements

The Contractor shall take detailed measurements of the tooth joint vertical misalignment and the end floor beam and stringer geometry. As part of the submissions required by Subsection 104, the Contractor shall submit a deck joint mismatch profile based on its measurements and a verification of the shim plate thicknesses shown on the plans noting any discrepancies that may exist between its plate sizes and the plan sizes.

1. Preparation Prior to Jacking

Remove the end diaphragms to reach the stringer to floorbeam connections. End diaphragms shall be removed by removal of the eight rivets attaching the diaphragm to the clip angle.

Remove the four rivet/bolted connection between the end floorbeam and stringers.

Re-erect the end diaphragms prior to jacking using eight A325 high-strength bolts at the clip angle connections.

1. Jacking of Superstructure

Jacking will be completed in such a manner as to adjust the joint for one roadway at a time. Jacks will be set as follows:

* Set jacks beneath stringers 1 to 6 of one roadway and stringer [insert stringer number(s)] of the opposite roadway. Jack the stringers as required to insert the shim plates. Jacking of stringer [insert stringer number(s)] of the opposite roadway will be limited to ¼ inch maximum rise. Several jacking attempts may be required to lift the stringers to the proper elevation to install the plates. The Contractor shall not release the jacks until all of the plates are installed or the stringers are properly blocked.
* Once all plates are installed at the proper elevation, the jacks can be removed. Bolts shall immediately be installed at the two stringer to floorbeam connections on the west side of the floorbeam.

1. Completion of Steel Repairs

Remove the end diaphragms to reach the stringer to floorbeam connections on the east side of the floorbeam.

Install A325 bolts at the floorbeam to stringer connections.

Clean all steel surfaces to the limits shown on the plans. This cleaning shall be limited to cleaning by SSPC-SP2 "Hand Tool Cleaning" and SSPC-SP3 "Power Tool Cleaning" to remove existing laminar corrosion.

Complete seal welding of the installed plates.

Complete painting in accordance with the applicable portions of Section 411.

Re-erect the end diaphragms. Complete additional touch up painting as required.

1. Tooth Joint Grinding

At locations along the joint where the addition of properly sized shim plates beneath the stringer does not remove the vertical mismatch between the opposing plates of the tooth joint to ⅛ inch or less, the Contractor shall achieve the ⅛ inch tolerance by grinding the plates.

439.05 Measurement

Deck Joint Realignment, Structure [insert number] shall not be measured and payment will be made on a lump sum basis.

Grind Tooth Joint shall be measured by the linear foot along the centerline of the joint to the nearest half foot and shall include grinding on either or both sides of the joint.

439.06 Payment

Payment will be made under:

PAY ITEM PAY UNIT

Deck Joint Realignment, Structure **[insert number]** Lump Sum

Grind Tooth Joint Linear Foot

The following Section is added:

Section 440 – Metallizing New Weathering Steel

440.01 Description

This work shall consist of metallizing new weathering steel stringers including furnishing all materials, equipment, labor, and other essentials necessary to accomplish surface preparation and shop application of thermal spray metallizing to portions of the new weathering steel stringers, for a distance of one-and-half (1.5) times the beam depth or five (5) feet from the beam end, whichever is greater, or as specified in the Plans. Also included in this work is the shop application of a paint system over the metallized coating where specified in the Plans. Diaphragms within the limits of metallized stringer limits shall either be metallized or galvanized as specified in the Plans.

440.02 Materials

Materials shall conform to the following Sections and Subsections:

Zinc Coating (Galvanizing) 909.11

Paints and Coatings 913

Metallizing Wire 913.10

440.03 Methods of Construction

1. References

The Contractor shall comply with the most recent version of the following laws, codes, standards, and regulations for work under this Section.

1. Surface Preparation, Metallizing and Painting Application
2. American Society for Testing Materials
3. ASTM B833: Standard Specifications for Zinc Wire for Thermal Spraying (Metallizing)
4. ASTM D4285-83 (2006): Standard Test Method for Indicating Oil or Water in Compressed Air
5. ASTM D4417-03: Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel
6. ASTM D4541: Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
7. ASTM A153/A153M Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
8. ASTM F3125/F3125M Standard Specification for High Strength Structural Bolts and Assemblies, Steel And Alloy Steel, Heat Treated,120 ksi and 150 ksi Minimum Tensile Strength
9. Code of Federal Regulations (CFR)
10. 29 CFR1926 Occupational Safety and Health Regulations for the Construction Industry
11. The Society for Protective Coatings (Formerly SSPC)
12. SSPC Painting Manual Volume 1 Good Painting Practice, and SSPC Painting Manual Volume 2 Systems & Specifications, 2008 Edition (or most recent editions). These volumes contain applicable standards, standard procedures, methods, specifications, guides, technology updates, technology reports, and technology guides. See Supplementary Specification Subparagraph 411.09(B)(24) for requirements.
13. SSPC-VIS 1 Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning
14. SSPC-VIS 3 Visual Standard for Hand and Power Tool Cleaned Steel
15. SSPC-CS 23.00/AWS C2.23M/NACE No. 12 – Specification for the Application of Thermal Spray Coatings (Metallizing) of Aluminum, Zinc, and Their Alloys and Composites for the Corrosion Protection of Steel
16. SSPC-PA 17, Procedure for Determining Conformance to Steel Profile/Surface Roughness/Peak Count Requirements
17. SSPC-PA 2, Procedure for Determining Conformance to Dry Coating Thickness Requirements.
18. Equipment and Coating Manufacturer’s Published Instructions

Follow the manufacturer’s instructions.

1. United States Department of Labor, Material Safety Sheets (MSDS)

File the MSDS sheets, storage and handling of materials shall be in accordance with MSDS sheets.

1. American National Standards Institute/American Welding Society
2. ANSI/AWS C2.25/C2.25M – Specification for Solid and Composite Wires, and Ceramic Rods for Thermal Spraying
3. AWS C2.16/C2.16M – Guide for Thermal-Spray Operator Qualification Programs
4. ANSI/AWS C2.25/C2.25M Specification for Thermal Spray Feedstock – Wire and Rods
5. Containment, Worker, and Environmental Protection
6. Code of Federal Regulations
7. 29 CFR 1926 Occupational Safety and Health Regulations for Construction
8. 29 CFR 1926.20 General Safety and Health Provisions
9. 29 CFR 1926.21 Safety Training and Education
10. 29 CFR 1926.55 Gases, Vapors, Fumes, Dusts, and Mists
11. 29 CFR 1910.134 Respiratory Protection
12. 29 CFR 1926.353 Ventilation and Protection in Welding, Cutting, and Heating
13. 29 CFR 1926.400-417 Electrical Safety
14. 40 CFR 50 National Primary and Secondary Ambient Air Quality Standards
15. 40 CFR 58 Ambient Air Quality Surveillance
16. 40 CFR 204 Noise Control Regulations for Air Compressors
17. 40 CFR 355 Emergency Planning and Notification
18. 40 CFR 265.16 Personal Training
19. 40 CFR 302 Designation, Reportable, Quantities and Notification
20. 40CFR 355 Emergency Planning and Notification
21. 49 CFR 171-179 Hazardous Materials Transportation Act (HMTA)
22. American Industrial Hygiene Association (AIHA)
23. American Board of Industrial Hygiene (ABIH) Certified Industrial Hygienist (CIH) Certification
24. American National Standard Institute (ANSI) A10.10
25. Safety requirements for temporary and portable space heating devices & equipment
26. Qualifications and Experience

The Contractor shall submit documentation to the Engineer providing evidence of the qualifications and experience of the proposed supervisors and as required by this Subsection.

1. Experience

The fabricator performing the shop metallizing and painting shall have satisfactorily performed a minimum of three (3) previous projects involving abrasive blast cleaning, metallizing, and paint application. At least one project within the past two (2) years shall have involved a bridge or similar industrial-type application.

The Contractor shall submit applicator experience and certification to the Resident Engineer for approval.

1. Qualification

All metallizing applicators shall be qualified in accordance with ANSI/AWS C2.16/C2.16M.

1. Working Drawings

The Contractor shall submit a Metallizing Plan which includes written procedures for the shop application of metallizing, the brand name and type of metallizing wire and application equipment to be used, methods of surface preparation and types of equipment and materials that will be used to prepare surfaces to receive metallizing. Additionally, any solvents proposed for solvent cleaning shall be identified and MSDS provided. The personnel qualifications shall be per Subsection 440.04. The Contractor shall also submit Quality Control plans for metallization. The working drawings shall also include the repairs procedures required if any damage is caused after the application of metallization due to lifting and delivery operation.

Proof that the metallizing wire complies with ASTM B833 and ANSI/AWS C2.25/C2.25M shall also be provided along with wire diameter used, lot number and manufacturing dates.

The Contractor shall provide a certificate of the chemical composition of the proposed metallizing wire from the metallizing wire manufacturer.

1. General

The surface preparation and metallizing shall be according to SSPC-CS 23.00/AWS C2.23/NACE No. 12: Application of Thermal Spray Coatings (Metallizing) of Aluminum, Zinc, and Their Alloys and Composites for the Corrosion Protection of Steel, except as modified herein. In the event of a conflict, the requirements of this specification shall govern.

If diaphragms are galvanized, work shall be per Subsection 909.11 with faying surface requirements per the Contract Plans.

1. Surface Preparation and Metallizing Equipment

The Contractor shall provide surface preparation and metallizing equipment as needed to perform the work as specified herein.

Metallizing application equipment shall be portable electric arc thermal spray units that are set up, adjusted, and operated in accordance with the manufacturer’s written instructions.

All cleaning equipment shall include gages capable of accurately measuring fluid and air pressures and shall have valves capable of regulating the flow of air or water as recommended by the equipment manufacturer. The equipment shall be maintained in proper working order. Diesel or gasoline-powered equipment shall be positioned or vented in a manner to prevent the deposition of combustion contaminants on any part of the structure.

Hand tools, power tools, pressure washing, water jetting, abrasive blast cleaning equipment, and spray equipment shall be of suitable size and capacity to perform the work required. Appropriate filters, traps and dryers shall be provided for the compressed air used for abrasive blast cleaning and spray application.

The surface to be metallized shall be prepared in the following order:

1. Prior to blast cleaning, all flame cut edges shall be ground to remove hardened steel and any sharp or irregular shapes.
2. All steel surfaces to be metallized shall be near white metal blast cleaned in accordance with SSPC-SP 10 using dry abrasive blast cleaning methods.
3. If hackles, burrs, or slivers in the base metal are visible on the steel surface after blast cleaning, the Contractor shall remove them by grinding followed by re-blast cleaning.

Blast cleaning abrasives shall be of the size and grade that will produce a uniform angular surface profile depth of 3.5 to 5 mils (89 to 127 microns). If the metallizing wire manufacturer’s profile requirements are more restrictive, the Contractor shall comply with those requirements. For recycled abrasives, an appropriate operating mix shall be maintained to control the profile within these limits.

The average surface profile shall be determined each workday with a minimum frequency of one location per every 200 sq ft (18.6 sq m) per piece of equipment. All surfaces, including flame cut edges, shall be tested in accordance with SSPC-PA 17. Surface profile replica tape or electronic profilometer shall be used. The tape shall be retained and included with Quality Control reports. Single measurements less than 3.5 mils (89 microns) are unacceptable. In that event, additional testing shall be done to determine the limits of the deficient area and, if it is not isolated, work will be suspended. The Contractor shall submit a plan for making the necessary adjustments to ensure that the specified surface profile is achieved on all surfaces. Work shall not resume until written acceptance is provided.

Prepared surfaces shall meet the requirements of SSPC-SP 10 immediately prior to metallizing and shall be metallized within six (6) hours of blast cleaning. If rust appears or bare steel has been exposed for more than six (6) hours, the affected area shall be re-blasted at no additional cost to the Authority. The diaphragm connection/faying surfaces shall not be metallized.

All dust and surface preparation residue on steel surfaces shall be removed prior to metallizing.

The quality of surface preparation and cleaning of surface dust and debris shall be accepted by the Authority’s representative prior to metallizing.

The Authority has the right to reject any work that was performed without adequate provision for Quality Assurance observations to accept the degree of cleaning. Rejected metallizing work shall be removed and replaced at no additional cost to the Authority. The Contractor shall submit the removal methods for Engineers approval.

1. Test Areas (Sections)

Prior to proceeding with production work on the project, the Contractor shall prepare test sections of at least ten (10) square feet (0.93 sq. m). More than one test section may be needed to represent the various design configurations of the structure. The test section(s) shall be blast cleaned and metallized in accordance with the requirements specified herein using the same equipment, materials and procedures that will be used for the production.

During the blast cleaning and metallizing of the test section(s), in the presence of the Authority’s representative, the Contractor shall perform all quality control tests and inspections required by this specification including complete documentation. In addition, the Contractor shall allow sufficient time for the Authority to perform any or all quality assurance tests and inspections desired.

Production work shall not proceed until the Authority agrees that the blast cleaning and metallizing, along with the quality control testing, inspection, and documentation are acceptable. Any changes to the materials, procedures and production will result in performing a new test, approved by the Authority.

1. Protective Coverings And Damage

The Contractor shall apply protective coverings to all surfaces of the structural steel that are not scheduled for surface preparation and metallizing. The coverings shall be maintained and remain in place until the work is completed and then shall be removed prior to shipping.

Metallized or metallized and painted surfaces damaged by any Contractor's operation shall be repaired, and re-metallized and/or re-painted, as directed by the Authority, at no additional cost to the Authority.

1. Ambient Condition

Surfaces prepared for metallizing shall be free of moisture and other contaminants. The Contractor shall control operations to ensure that dust, dirt, or moisture are not present on the surfaces where work will take place. The surface temperature shall be at least 5°F (3°C) above the dew point during final surface preparation operations, and the application of metallizing. Metallizing shall only be applied when the surface and air temperatures are above 32°F (0°C). Metallizing shall not be applied in rain, wind, snow, fog, or mist. Ambient conditions shall be maintained during the drying period as specified by the manufacturer.

1. Compressed Air Cleanliness

Prior to using compressed air for abrasive blast cleaning, blowing down surfaces, and metallizing applications, the Contractor shall verify that the compressed air is free of moisture and oil contamination according to the requirements of ASTM D4285. The tests shall be conducted at least one time per shift for each compressor system in operation. If air contamination is evident, the Contractor shall change filters, clean traps, add moisture separators or filters, or make other adjustments as necessary to achieve clean, dry air. The Contractor shall also examine the work performed since the last acceptable test for evidence of defects or contamination caused by the contaminated compressed air. Contaminated work shall be repaired at no additional cost to the Authority.

1. Solvent Cleaning

All traces of oil, grease and other detrimental contaminants on the steel surfaces to be metallized shall be removed by solvent cleaning in accordance with SSPC-SP 1. The brand name of proposed cleaning solvent(s) and/or proprietary chemical cleaners including manufacturers’ product data sheet and MSDS shall be submitted for acceptance prior to use.

Under no circumstances shall blast cleaning be performed in areas containing surface contaminants or in areas where solvent cleaning has not been accepted. Rejected surfaces shall be re-cleaned to the specified requirements at no additional cost to the Authority.

1. Abrasives

Abrasive blast cleaning shall be performed using either expendable abrasives or recyclable steel grit abrasives. Expendable abrasives shall be used one time and discarded. The abrasive shall be angular in shape. Acceptable angular-shaped abrasives include, but are not limited to, aluminum oxide, steel grit, and crushed slag. Silica sand shall not be used. Steel shot and other abrasives producing a rounded surface profile are not acceptable, even if mixed with angular grit abrasives.

Abrasive suppliers shall provide written certification that expendable abrasives and recyclable steel grit abrasives meet the requirements of SSPC-AB 1 and AB 3, respectively. Abrasive suppliers shall certify that abrasives are not oil contaminated and shall have a water extract pH value within the range of 6 to 8. On a daily basis, the Contractor shall verify that recycled abrasives are free of oil and contamination by performing a vial test in accordance with SSPC-AB 2.

All surfaces that are found to have been prepared using abrasives not meeting the SSPC-AB 1, AB 2, or AB 3 requirements, as applicable, are oil contaminated or have a pH outside the specified range, shall be solvent cleaned or low-pressure water cleaned, and re-blast cleaned at no cost to the Authority.

1. Daily Metallizing Operator-Equipment Qualification - Bend Tests

Unless directed otherwise, each day that metallizing will be applied, the Contractor shall perform bend testing prior to beginning production work. For each metallizing applicator, five carbon steel coupons measuring 2 inch wide x 8 inch long x 0.05 inch (50mm x400 mm x 1.3 mm) thick shall be blast cleaned using the same equipment and abrasive used for the production work. Each applicator shall apply the metallizing to five coupons in accordance with the requirements of this Specification to a dry film thickness of 8.0 to 12.0 mils (200 to 300 microns). 180 degree bend testing shall be performed on all five coupons using a 13mm (1/2”) mandrel in accordance with the requirements and acceptance criteria of SSPC-CS 23/AWS C2.23M/NACE 12. Minor cracks that cannot be lifted from the substrate with a knife blade are acceptable. If lifting occurs on any coupon, the surface preparation and/or metallizing process shall be modified until acceptable results are achieved before proceeding with production work.

1. Application of Metallizing

The application shall be done in overlapping passes in a cross-hatch pattern (i.e., the second set of overlapping passes shall be applied at right angles to the first set of overlapping passes) to ensure uniform coverage. The gun shall be held at such a distance from the work surfaces that the metal is still molten on impact. The metallizing shall be applied as a continuous film of uniform thickness, firmly adherent, and free from thin spots, misses, lumps or blisters, and have a fine sprayed texture. Thin spots and misses shall be re-metallized. If touch-up metallizing or the application of additional metallizing to previously applied metallizing does not occur within 24 hours, the surface of the metallizing shall be brushed off blast cleaned according to SSPC-SP7 to remove oxidation and surface contaminants prior to the application of additional metallizing. The final appearance of the metallizing shall be uniform without excessive blotchiness or contrast in color. If the surface does not have a uniform appearance, remove and replace the metallizing at no cost to the Authority. If the configuration of the surface being metallized does not allow for a proper gun-to-work piece standoff distance, the Contractor shall notify the Authority.

Areas on the bottom flanges of stringers that will bear on sole/load plates shall not be metallized. Additionally, areas along each flange that will receive field weldments to connect bearing components shall not be metallized. Blast clean and apply a prime coat of paint only to these areas.

Unless required by the Plans, the top of the top flanges of stringers and end diaphragms shall not be metallized. Blast clean and apply a prime coat of paint only to these areas.

1. Metallizing Thickness And Adhesion

The thickness of the metallizing shall be 8.0 to 12.0 mils (200 to 300 microns). Thickness shall be measured as specified by SSPC-PA 2 (use a Type 2 Electronic Gauge only).

Adhesion testing of metallizing applied each day shall be determined with a self-adjusting adhesion tester in accordance with ASTM D4541. Unless otherwise directed by the Authority, a minimum of one test shall be conducted for every 500 sq ft (46 sq m) of the metallized surface. If any of the tests exhibit less than 700 psi (4.83 MPa), additional tests shall be conducted to determine the extent of the deficient material. All deficient metallizing shall be removed by blast cleaning and re-applied at no additional cost to the Authority.

At the discretion of the Authority, a representative blast cleaned test panel (or steel companion panel approximately 12-inch x 12-inch x ¼ inch thick) can be metallized at the same time each 500 sq ft (46 sq m) of surface area, or portion thereof, is metallized. Adhesion testing can be performed on the companion panel rather than on the structure. If the adhesion tests on the panels are acceptable, the metallizing on the structure is considered acceptable and testing on the structure is not required. If adhesion testing of the panels fails, testing shall be conducted on the structure. If adhesion testing on the structure is acceptable, the metallizing on the structure is considered acceptable. If tests on the structure are unacceptable, complete removal of the failing metallizing and re-metallizing in accordance with the specifications shall be performed at no additional cost to the Authority.

1. Application Of Paint Systems Over Metallizing

Where painting over the metallizing is specified, a three-coat system conforming to the requirements of Subsection 411.06 shall be used, subject to the manufacturer’s requirements for application over a metallized surface. Paint shall not be applied to the diaphragm connection faying surfaces, at bearing locations and top of top flanges of diaphragms and stringer.

[Designer must update the Supplementary Specification for painting accordingly.]

1. Touch-up To Completed Coating System

The Contractor shall repair all damaged and/or unacceptable areas of the completed coating system (all metallizing and paint layers) prior to shipment as defined below. The same process shall be followed for the repair of shipping, handling, and erection damage.

Damage to the metallizing and/or paint that does not expose the substrate shall be prepared by solvent cleaning in accordance with SSPC-SP 1 followed by power tool cleaning in accordance with SSPC-SP 3 to remove loose material. For the repair of damaged metallizing that exposes the substrate, the surface shall be spot blast cleaned in accordance with SSPC-SP 10. If blast cleaning cannot be performed, as authorized by the Authority, the damage shall be spot power tool cleaned to SSPC-SP 11.

The metallizing and/or paint surrounding each repair area shall be feathered for 1 to 2 inches (25 to 50 mm) to provide a smooth, tapered transition into the existing intact material. The surrounding intact paint shall be roughened to promote the adhesion of the repair coats.

Damage to metallizing extending to the substrate shall be repaired. For metallizing, it is critical that all remnants of sealer or paint have been removed from the porosity of the metallizing before applying new metallizing or an adhesion failure can occur. If it is no longer feasible to apply metallizing, spot-apply an organic zinc primer meeting the requirements of Paragraph 411.05(F). After priming, apply the same intermediate and finish coats used on the surrounding steel. If the damage does not expose the substrate, only the affected paint coat(s) shall be applied.

1. Surface Preparation Of Galvanized Fasteners

All ASTM F3125, Grade A325, high-strength steel bolts, nuts and washers used to connect metallized components shall be hot dip galvanized according to ASTM A153.

1. Shipping and Handling

The Contractor shall take special care in handling the steel in the shop and when loading for shipment. Metallized and/or painted steel shall not be moved or handled until sufficient cure time has elapsed to prevent handling damage. During shipping, the steel shall be insulated from the moving apparatus (i.e., chains, cables, hooks, clamps, etc.) by softeners approved by the Authority. The apparatus used to hoist the steel shall be padded. The steel shall be placed on wood dunnage and spaced in such a manner that no rubbing will occur during shipment that could damage the paint or metallizing.

440.04 Measurement

Metallizing of new weathering structural steel, including the surface preparation and the test section, will not be measured for payment.

Painting of new metallized structural steel will not be measured for payment.

440.05 Payment

No separate payment will be made for metallizing the new weathering structural steel, but the costs thereof will be considered incidental to the associated structural steel or prefabricated superstructure unit items.

No separate payment will be made for the development and implementation of the Metallizing Plan, but the costs thereof will be considered incidental to the associated structural steel or prefabricated superstructure unit items.

Working drawings and other submittals listed in this Section and as required for this Contract, shall be submitted in accordance with Subsection 104.08.

Separate payment for the painting of new metallized structural steel will not be made.

Division 500 - Incidental Construction

Section 502 – Storm Drains

502.02 Materials

Delete the fourth paragraph and replace it with the following:

The pipe joint patch material shall be as specified in Subsection 917.09.

502.05 Payment

Add the following language after the end of the second paragraph:

Unless otherwise provided for, the placement of dense graded aggregate, Embankment Grade A, and asphalt materials required for restoration will not be paid for separately.

Section 503 – Manholes And Inlets

503.02 Materials

Add the following:

Brick Masonry Units 916.02

503.03 Methods of Construction

* + 1. Frames, Grates and Covers

Delete the sixth paragraph and replace it with the following:

An extension frame shall be used to reset Type G1 frame and grate.

* + 1. Reconstruction and Conversion of Existing Structures

Add the following to the end of Subparagraph (5):

Repair of inlets and manholes in excess of 1 foot shall be considered reconstructing manholes and inlets.

503.05 Payment

Add the following item:

PAY ITEM PAY UNIT

Set Square Framed Manhole Casting, Circular Cover Each

Delete the second sentence of the fourth paragraph and replace it with the following:

Unless otherwise provided for, the placement of dense graded aggregate, Embankment Grade A, and asphalt materials required for restoration will not be paid for separately.

Section 508 – Concrete Median Barrier

508.03 Methods of Construction

Insert the following after the eleventh paragraph:

Modified concrete median barrier, protection will require site specific forms different than those normally associated with this work. Special extrusion (slip-form) equipment and techniques will be required for molding the variable height barrier transition sections.

508.04 Measurement

Insert the following after the second paragraph:

Variable height barrier transition section lengths for modified concrete median barrier protection are included in the payment lengths for modified concrete median barrier, protection as shown on the plans.

508.05 Payment

Add the following:

PAY ITEM PAY UNIT

Modified Concrete Median Barrier, Protection Linear Foot

Delete the fourth paragraph and replace it with the following:

Concrete median barrier and modified concrete median barrier in protection areas are to be paid for in linear feet based on each side of the protected area. No separate payment will be made for common embankment or 4-inch concrete slab between barrier protection.

Section 509 – Sign Panels

[Include the following with Contracts involving sign removal:]

509.03 Methods of Construction

Delete Paragraph (M) in its entirety.

1. Sign Removals

Add the following:

The removal of overhead sign panels shall include removing existing sign hangers, stringers, all connection hardware, lighting bracket if any, and disposing of all non-salvageable material outside of Authority property, as determined by the Engineer.

Section 510 – Guide Rail

Delete this Section in its entirety and replace with the following:

510.01 Description

Guide Rail shall consist of steel rail elements mounted on steel posts and recycled/synthetic blockouts, with anchorages, connections, terminals, and other guide rail appurtenances in accordance with the Plans. Work shall include removal, furnishing and installing, salvaging existing single-faced and dual-faced beam guide rail, and resetting guide rail with salvaged material. Work shall also include furnishing and installing side mounted delineators along the beam guide rail element.

When applicable, this work shall also include the installation of end terminals in accordance with manufacturer’s recommendations. The Contractor and Subcontractor (if applicable) will be required to have their foremen and superintendents (at a minimum) attend a mandatory training session presented by the manufacturer, prior to the start of construction.

Refer to Section 524 when terminating single-faced or dual-faced beam guide rail with a re-directive impact attenuator.

510.02 Materials

Materials shall conform to the following Subsections:

Rail Element 915.01

Posts and Recycled/Synthetic Blockouts 915.02

Rub Rail 915.05

Miscellaneous Hardware 915.03

Guide Rail Delineators 915.06

Terminals and Anchorages 915.07

Portland cement concrete for anchorages and post foundations shall conform to Section 905, Class B.

All metal components along the New Jersey Turnpike and Garden State Parkway shall be galvanized in accordance with Subsection 909.11. All galvanized metal components along the Garden State Parkway shall be pre-stained with a reactive color treatment in accordance with Paragraph 915.01(A). Treated beam guide rail that is damaged, as determined by the Engineer, shall be replaced with the same treatment and protocol as the original product application as defined in Section 915.01(A) or repaired in accordance with the reactive color treatment product manufacturer’s recommendations.

The Contractor shall submit the manufacturer’s certificates of compliance in accordance with Subsection 105.04 and shall include the following information specific to all metal components within Section 915:

1. Material test reports for all steel used
2. Certificate of compliance for hot dip galvanizing
3. Certificate of compliance for reactive color treatment product applied to hot dipped galvanized guide rail. The reactive color treatment certification shall include:
4. Product Trade Name
5. Chemical composition of the product
6. Batch or production run identification and date
7. Product concentration, application rates, and number of coats
8. Ambient conditions during product application and intermittent or final curing
9. Duration of time from product application to intermittent or final cure

510.03 Methods of Construction

Prior to installing posts, the location of underground electrical conduits and other utilities, which may conflict with the posts, shall be determined. The Contractor must contact New Jersey One Call on-line ([www.nj1-call.org](http://www.nj1-call.org)) or by dialing 811 or (800) 272-1000 for a utility mark-out in accordance with Subsection 106.18. Post spacing may be adjusted by 6 inches, as approved by the Engineer, to eliminate such conflicts. The Contractor's attention is directed to Subsection 106.18, pertaining to utilities. Test pits, as directed, shall be made as specified in Section 522.

Remove trees and shrubs as specified in Subsection 201.03 along the entire length of the beam guide rail to be installed, extending a minimum of 4 feet behind the guide rail post.

The rail elements shall be constructed with the top edge in a straight line or smooth curve parallel to or concentric with the roadway. Where a vertical transition is required, the top edge of rail elements shall form the chords of a smooth vertical curve. The top of rail element height for all new guide rail installations shall be 31 inches. New guide rail shall be constructed with an allowable tolerance of +1 inch to -1 inch for the top of rail element height. The absolute tolerance for the top of rail element height for 31-inch-tall guide rail is +1 inch to -3 inches for rehabilitation projects.

Attach the beam guide rail element to the blockout at every post. No punching, drilling, reaming, or cutting of the rail elements will be permitted in the field unless specifically approved by the Engineer. Neither torchcutting nor welding of rail elements will be permitted. All new material shall be furnished, except where resetting or salvaging is called for. Damaged galvanized surfaces shall be repaired in accordance with Subsection 403.16. Repair damage to the pre-stained galvanized coating, if applicable, according to Subsection 915.01. Galvanized and pre-stained galvanized coatings damaged during installation of the beam guide rail, anchorages, connections, and treatments as shown on the Plans shall be repaired at the Contractor’s expense.

The installation shall be made in such a manner that no unprotected end is exposed to approaching traffic.

* + 1. Beam Guide Rail

Within the same working day, replace all existing beam guide rail that is removed. Where possible, install new beam guide rail exposed to approaching traffic before the removal of the existing system.

If it is suspected that utility conduit is present, the Engineer may require tests to ensure the integrity of the conduit if it is suspected that the conduit may have been damaged during installation of the guide rail. The tests may include, but are not limited to:

1. Tests for continuity.
2. Tests for ground.
3. Tests for insulation resistance between circuit wires and from circuit wires to ground.

Locate and repair damage to the utility conduit due to construction operations.

Drive beam guide rail posts to the required position. Ensure that posts are driven plumb, properly spaced, and to the line and grade shown.

Install the required connections and attachment types as shown on the Plans. Mount bridge beam guide rail posts as shown on the Plans.

Repair damage to the galvanized coating according to Subsection 403.16.

Repair damage to the pre-stained galvanized coating, if applicable, according to Subsection 915.01.

Install guide rail delineators in accordance with the standard drawings and Subsection 915.06.

* + 1. Parapet Connections

Parapet connections of the types required shall consist of terminal connector, back-up plate(s), rail element(s), posts, and blockouts. Bolt holes through the parapets shall be core drilled through existing parapets or formed through new parapets using non-corrosive sleeves for each bolt.

* + 1. Rub Rail

When rub rail is required, bolt rub rail consisting of a steel channel or a bent plate to the beam guide rail posts.

* + 1. Terminals and Anchorages

Install tangent guide rail terminals according to the manufacturer’s recommendations and Subsection 915.07. At least 10 days before beginning the work, submit the manufacturer’s recommendations to the Engineer.

Install buried end terminals and anchorages in accordance with the standard drawings and Subsection 915.07.

Excavate for post holes and foundation tubes as specified in Subsection 206.03. Backfill and compact using the directed method as specified in Subsection 206.03.

Excavate cut slope as specified in Subsection 206.03 within the limits of the buried guide rail end terminal. Drive beam guide rail posts for buried guide rail terminal to the required position. Ensure that posts are driven plumb, properly spaced, and to the line and grade shown. Attach the beam guide rail element to the blockout at every post. Attach the beam guide rail element and plate to the terminal posts. Backfill with excavated material as specified in Subsection 206.03.

* + 1. Reset Beam Guide Rail

Reset Beam Guide Rail consists of using salvaged material to construct the specified item.

The salvaged material shall be carefully loaded at the location specified and transported to the area where it is to be installed. Available salvaged material shall consist of beam guide rail elements, posts, blockouts, nuts, bolts, washers, and plates, unless otherwise specified. Salvaged material may include pre-stained beam guide rail elements, posts, and other metal components. Any salvaged material damaged due to carelessness, shall be replaced without additional compensation.

In areas designated on the plans, salvaged beam guide rail shall be reset using recycled/synthetic blockouts in place of the existing steel or wooden blockouts. The Contractor shall supply new hardware as required for the installation of the salvaged beam guide rail on new recycled/synthetic blockouts. For galvanized steel beam guide rail elements and galvanized posts, the bolt holes for the recycled/synthetic blockouts shall be treated in accordance with Subsection 403.16. Posts damaged during the drilling of bolt holes shall be replaced at the Contractor’s expense.

Work will also entail installing guide rail delineators in accordance with Paragraph 510.03(A).

* + 1. Removal of Beam Guide Rail

Removal of Beam Guide Rail shall consist of dismantling, removing and disposal of guide rail elements, posts, blockouts and hardware. Work shall include cutting existing anchor bolts flush with concrete surfaces and refilling and patching post holes with material similar to that of the adjoining area.

After removing beam guide rail, backfill the post holes and compact the area to the elevation of the adjacent surface. Materials and debris shall be disposed of in accordance with all applicable Federal, State and Local laws.

* + 1. Beam Guide Rail Post, \_\_\_\_’ Long

Beam Guide Rail Post, \_\_\_\_’ Long shall consist of the installation of various lengths of new rail posts in excess of 6 feet long as specified in Paragraph 510.03(A), including the recycled/synthetic blockout and required hardware for mounting to the beam guide rail element.

* + 1. Beam Guide Rail Element

Beam Guide Rail Element shall consist of the installation of new rail element on existing beam guide rail blockouts in accordance with Paragraph 510.03(A) and shall include the required hardware for mounting the beam guide rail element to the existing blockout.

Work will also entail installing guide rail delineators in accordance with Paragraph 510.03(A).

* + 1. Beam Guide Rail Blockout

Beam Guide Rail Blockout shall consist of the installation of new blockouts between existing beam guide rail element and beam guide rail posts in accordance with Paragraph 510.03(A) and shall include the required hardware for mounting to the beam guide rail element and the beam guide rail posts.

Where beam guide rail is attached to a structure, attach the blockout to the structure. Reset the beam guide rail, as specified in Paragraph 510.03(E) to provide a smooth transition to the existing structure.

510.04 Measurement

Beam Guide Rail will be measured by the length in place along the face of rail between centers of end posts, excluding the pay limits for parapet connections, anchorages, and end terminals. Dual- faced rail items will be measured by the linear foot along the face of one rail excluding the pay limits for anchorages and end terminals.

Beam Guide Rail Element and Rub Rail will be measured by the linear foot along the face of the rail measured from centers of end posts.

Beam Guide Rail Anchorages, Parapet Connections, Beam Guide Rail Buried End Terminals, Tangent Guide Rail Terminals, and Beam Guide Rail Blockouts will be measured by the number of each installed to the limits as indicated on the plans. Anchorages and parapet connections for dual faced beam guide will be measured by the number installed for each face of rail.

Beam Guide Rail Posts and Beam Guide Rail Posts, \_\_\_\_’ Long, that are in addition to those included under the various guide rail items, will be measured by the number of each post of the indicated length installed.

Reset Beam Guide Rail will be measured as specified above for Beam Guide Rail.

Removal of Beam Guide Rail will be measured by length of existing beam guide rail removed, as shown on the plans, and as directed by the Engineer.

No separate measurement will be made for the guide rail delineators or for the hardware used to attach the delineators to the face of the beam guide rail element.

No separate measurement will be made for new hardware as needed for resetting beam guide rail.

No separate measurement will be made for the end section (rounded or buffer) associated with the beam guide rail and anchorages as shown on the Plans.

510.05 Payment

Payment will be made under:

PAY ITEM PAY UNIT

Beam Guide Rail Linear Foot

Beam Guide Rail, Pre-Stained Linear Foot

Beam Guide Rail, Dual-Faced Linear Foot

Beam Guide Rail, Dual-Faced, Pre-Stained Linear Foot

Beam Guide Rail Element Linear Foot

Beam Guide Rail Element, Pre-Stained Linear Foot

Reset Beam Guide Rail Linear Foot

Reset Beam Guide Rail, Dual Faced Linear Foot

Beam Guide Rail Blockout Each

Beam Guide Rail Anchorage Each

Beam Guide Rail Anchorage, Pre-Stained Each

Parapet Connection, Type A Each

Parapet Connection, Type A, Pre-Stained Each

Parapet Connection, Type B Each

Parapet Connection, Type B, Pre-Stained Each

Beam Guide Rail Buried End Terminal Each

Beam Guide Rail Buried End Terminal, Pre-Stained Each

Tangent Guide Rail Terminal Each

Tangent Guide Rail Terminal, Pre-Stained Each

Beam Guide Rail Post Each

Beam Guide Rail Post, Pre-Stained Each

Beam Guide Rail Post, \_\_\_\_’ Long Each

Beam Guide Rail Post, \_\_\_\_’ Long, Pre-Stained Each

Removal Of Beam Guide Rail Linear Foot

Rub Rail Linear Foot

Rub Rail, Pre-Stained Linear Foot

Test Pits will be paid for in accordance with Section 522. Separate payment will not be made for other excavation and backfill.

No separate payment will be made for the guide rail delineators or for the hardware used to attach the delineators to the face of the beam guide rail element.

No separate payment will be made for new hardware as needed for resetting beam guide rail.

No separate payment will be made for the end section (rounded or buffer) associated with the beam guide rail and anchorages as shown on the Plans.

Section 515 – Delineators

515.02 Materials

Add the following:

Aluminum Sheet Sign Panels and Incidental Hardware 912.01

Sign Copy and Background 912.02

Section 516 – Pavement Markings

Delete this Section in its entirety and replace it with the following:

516.01 Description

This work shall consist of marking bituminous surfaced roadways and concrete bridge decks and surfaces with a pavement marking system comprised of a binder material with retroreflective components. Pavement marking binders are broadly classified into two categories: extruded/sprayed and preformed. Extruded/sprayed materials encompass any pavement marking product that is applied in liquid form. Preformed materials are solid products that come to the site already formed to the width or shape that will be placed. Retroreflective components consist of glass beads and wet reflective optics. Pavement marking systems shall be surfaced applied or recessed into the roadway surface as required by the contract documents.

Pavement markings shall be used as indicated on the contract documents for marking of stripes, lines, and symbols as defined as follows:

* **“Traffic Stripes”** are the various widths and colors of lines (solid, broken, and dotted) used to designate lanes and shoulders on roadways.
* **“Traffic Lines”** are the various types and materials for diagonal and channelizing gore lines, crosswalks, stop lines, or other pavement lines not covered under “traffic stripes.”
* **“Traffic Symbols”** are the various types and materials for words, arrows, or other pavement symbols.
* **“Temporary Pavement Striping”** is a pavement marking system for use in temporary traffic conditions during staged construction or in final traffic conditions on existing bituminous surfaced roadways and concrete bridge decks and surfaces as required by the contract documents. Binder materials for temporary pavement striping may be latex paint, thermoplastic, epoxy resin, or removable wet reflective pavement marking tape as required by the Contract documents or as directed by the Engineer. Temporary pavement stripes shall be surface applied (not recessed) with glass beads as applicable. Temporary pavement stripes do not require wet reflective optics unless otherwise directed.
* **“Durable Pavement Marking”** is a pavement marking system for use in final traffic conditions on newly resurfaced or constructed bituminous surfaced roadways and concrete bridge decks and surfaces. Binder materials for durable pavement markings may be permanent tape, thermoplastic, and epoxy resin as required by the Contract documents or as directed by the Engineer. All durable pavement marking systems shall include both glass beads and wet reflective optics to optimize dry and wet reflectivity.

Durable pavement markings shall generally be applied for the limits of pavement removal and resurfacing projects and new full depth pavement construction within Authority jurisdiction as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| **Table 516-01 – Pavement Marking Summary** | | | |
| **Surface** | **Marking** | **Material** | **Recessed** |
| Asphalt (Bituminous) | Solid (Edge Line) | Thermoplastic | Yes |
| Broken or Dotted | Permanent Tape | Yes |
| Lines or Symbols | Thermoplastic | No |
| Concrete | Solid (Edge Line) | Permanent Contrast Tape | Yes |
| Broken or Dotted | Permanent Contrast Tape | Yes |
| Lines or Symbols | Epoxy Resin | No |

516.02 Materials

Materials shall conform to the following Subsections:

Latex Paint 913.04(A)

Epoxy Resin 913.04(B)

Thermoplastic 913.04(C)

Permanent Tape 913.04(D)

Black Paint 913.04(E)

Glass Beads 913.04(F)

Wet Reflective Optics 913.04(G)

Removable Wet Reflective Pavement Marking Tape 920.10

Removable Black Line Mask 920.14

The Contractor shall warrant for the first year that a minimum 95% of marking installations shall remain intact and serviceable. The installed material shall show no fading, lifting, shrinking, tearing, rollback, distortion or chipping due to vehicular traffic or normal maintenance activities including snow plowing. All markings shall retain a minimum retroreflective value of 150 mcd/m2/lxone year after installation. The Contractor shall replace, entirely at the Contractor’s expense, such amount of markings, if any, required to meet the minimum stated percentage. The Engineer will indicate the markings to be replaced to meet the minimum stated percentages. The Contractor shall also replace those markings that fail the minimum value for retroreflectivity. Replacement under either situation shall include all materials, equipment, labor and work incidental thereto.

The Contractor shall provide to the Authority, at no extra cost, any manufacturer’s warranties or guarantees that exceed the minimum requirements stated previously, that are normally provided by the manufacturer.

Permanent tape shall be warrantied in writing for a period of four years from the date of installation.

516.03 Equipment

Pavement marking materials shall be applied by equipment as recommended by the manufacturer. The equipment shall be designed to apply lines, stripes, and symbols of uniform cross sections, clear‑cut edges, and even and uniform film thickness of binder material.

The equipment for dispensing the glass beads and wet reflective optics shall mechanically and automatically distribute the beads and wet reflective optics in a uniform pattern and quantity per square foot of pavement marking, regardless of variation in speed of travel of the distributing equipment. The dispensing equipment may be an integral part of the pavement marking machine, or may be a self‑contained unit suitably designed for attachment to the pavement marking machines used by the Contractor, so that the glass beads and wet reflective optics will be applied immediately following the application of the extruded/sprayed binder material.

Pavement marking equipment shall be cleaned at the end of each day's work, or more often if necessary, to insure the application of pavement markings of the specified quality and physical requirements.

1. Epoxy Resin Pavement Marking Equipment

The epoxy pavement marking unit shall be so designed, equipped, maintained, and operated that the material is properly applied in variable widths at a consistent temperature. The epoxy pavement marking unit shall include a tachometer and a pressure gauge and calibrated holding vessel for each component. The holding vessels for the epoxy pigments and the hardener shall have thermometers for measuring the temperature of the vessel contents. The striping unit shall be equipped with a separate power unit for the pumps used in the mixing and distribution of the components. The following shall be furnished with each epoxy striping unit:

1. A calibration sheet that shows the number of the truck body, the capacity thereof, and an outage table in increments of not over ½ inch. This calibration sheet must be certified by the manufacturer or testing agency.
2. A metal rod for each holding vessel, with accurate divisions marked and consecutively numbered starting at the bottom. The rod shall be not less than 1 foot longer than the depth of the vessel.
3. Slip-proof steps with handrail to reach ground level
4. Slip-proof catwalk with handrail, running along the top of the vessel.
5. Fire extinguisher in working order.
6. Thermoplastic Pavement Marking Equipment

The equipment for applying thermoplastic binder material shall be capable of providing continuous mixing and agitation of the material. The parts of the equipment conveying the material between the main reservoir and the shaping die shall be so constructed to prevent accumulation and clogging. The mixing and conveying parts and the shaping dies or spray gun shall be capable of maintaining the material at optimum thermoplastic temperature. The equipment shall be so constructed to ensure continuous uniformity in the dimensions of the entire stripe or marking. The kettle provided for the melting and heating of the thermoplastic material shall be equipped with an automatic thermostat control device and heated by a controlled heat-transfer liquid rather than by a direct flame. The heating kettle and applicator shall be equipped and arranged to meet the National Board of Fire Underwriters and State and Federal regulations. The parts of the equipment that come in contact with the material shall be easily accessible for cleaning and maintenance.

1. Diamond Grinding Equipment

Equipment shall include a free-floating cutting or grinding head to provide a consistent recess depth over irregular pavement surfaces. The type and configuration of the cutting head used to grind the recess shall produce the appropriate surface profile for the pavement marking material to be applied. Any ridges in the bottom of the recess must have a maximum height of 0.015 inches.

The diamond grinding equipment must be capable of installing a recess 6 inches away from any vertical or horizontal obstruction.

Shrouds and a vacuum apparatus shall be included as part of the diamond grinder to remove larger pieces of pavement that are ground out

1. General

All equipment for applying markings shall be equipped with dispensers of a type that will mechanically and automatically dispense beads and wet reflective optics uniformly on sprayed/extruded markings at the rates specified.

Equipment for removing the various types of pavement markings shall be designed with a vacuum system to remove all millings from the pavement surface and prevent airborne residue from escaping into the atmosphere.

516.04 Methods of Construction

Work shall be done in accordance with the following:

1. Durable Pavement Markings

All durable pavement markings shall conform to the location, alignment, width, length, size, color and spacing shown on the Plans. All pavement markings are to be positioned a minimum of 4 inches from the respective pavement joint or as otherwise indicated, measured from the nearest edge of the pavement marking binder (surface applied) or diamond grinding (recessed). The layout for such pavement markings shall be the responsibility of the Contractor based on guide markers and directions of the Engineer.

At the intersections of white and yellow traffic stripes, the yellow stripe shall be applied first and after the binder material has dried, the white stripe applied over the yellow.

The glass beads and wet reflective optics shall be applied separately onto the markings, following the application of the binder material to the roadway surface. The binder material shall bind the glass beads and wet reflective optics in such a manner that it will produce maximum adhesion, refraction, and reflection. For recessed traffic stripes, use a double-drop of wet reflective optics and glass beads, or approved alternative.

Surfaces upon which pavement marking materials are to be applied shall be free of moisture, both external and internal. Sufficient time, in accordance with the manufacturer’s recommendations, shall elapse after rain, sleet, snow, ice, dew, or frost to permit the surface to become thoroughly dry prior to applying pavement marking materials. Newly placed asphalt shall be allowed to cure for a minimum of 24 hours prior to placement of durable pavement markings.

The Contractor shall remove, immediately prior to applying pavement marking material to the pavement surface, all dirt, oil, grease, existing types of pavement markings, and other foreign material, including curing compound on new portland cement concrete. The surface shall be cleaned one inch beyond the perimeter of where the pavement marking is to be placed.

The Contractor shall apply a primer‑sealer conforming to NJDEP volatile organic content (VOC) requirements to the areas of bituminous concrete surfaces, when recommended by the manufacturer, and to the areas of portland cement concrete surfaces where durable permanent pavement markings are to be placed.

Pavement marking materials shall be placed only upon surfaces which are dry and free from all dirt, foreign materials, scale, unbonded concrete, or mortar and shall be cleaned to the extent necessary. Pavement markings shall not be applied to any surface until such surface has been inspected by the Engineer and approved as being satisfactory for the application of striping materials. Unsatisfactory pavement markings, resulting from the presence of dirt, scale, or moisture, shall be thoroughly removed by an acceptable method and replaced by the Contractor at his own expense. Pavement markings shall not be applied when the air or surface temperature is below 35ºF, and in accordance with the manufacturer’s recommendation.

Pavement markings erroneously applied, spilled or dripped on the roadway surface or other Authority property in unauthorized places, shall be removed by the Contractor at his own expense and to the satisfaction of the Engineer. The Contractor will be liable for all damages resulting from the spattering of marking material on passing vehicles.

Unless permission is specifically given by the Engineer, glass beads and wet reflective optics shall not be applied under a strong wind. When such permission is granted, however, the height of the dispenser above the roadway shall be decreased to ensure proper distribution and minimize possible loss of material and, if so directed, the application rates shall also be increased to counteract such loss.

Coordinate a pre-application meeting at least thirty (30) days prior to starting the installation of any pavement markings. At the pre-application meeting, provide the Engineer with the following:

The source of supply for the pavement marking material and surface preparation adhesive, as applicable, and the manufacturer’s written instructions for use. These instructions are to include, but not be limited to, the application temperatures.

Procedures for installing traffic stripe recesses with diamond saw blades.

Procedures for installing traffic stripes within the recesses.

Procedures for removing existing striping and use of temporary striping, as necessary.

Provide a copy of the manufacturer’s recommendations to the Engineer at least thirty (30) days prior to starting the installation of any pavement markings.

Provide a notarized copy of the manufacturer’s certification including the material’s date of manufacture and National Transportation Product Evaluation Program (NTPEP) code number.

The Contractor shall arrange for and have each pavement marking material manufacturer's representative on the site for the first full day of applying the pavement markings to provide technical assistance.

The Contractor shall have onsite during pavement marking installations, personnel who are certified in accordance with the pavement marking material manufacturer's certification requirements.

The Contractor shall furnish a retroreflectometer for the Engineer's use in determining the retroreflectance values of the various pavement markings. This equipment is for the sole use of the Engineer and will become the property of the Contractor after Acceptance. The retroreflective data collected for the final pavement markings shall be provided to the Authority in an approved format.

Diamond grinding shall be performed to install recesses in roadway surfaces for traffic stripes as noted on the Contract Plans. See Paragraph 516.04(B).

Pavement marking operations shall not begin until all applicable surface preparation work is completed and approved by the Engineer, and the atmospheric conditions and pavement surface temperature is within the tolerance set by the Manufacturer and is acceptable to the Engineer.

The Contractor shall demonstrate to the Engineer the application of the broken white lines for a distance of 500 feet. The Engineer shall approve the test strip before the contractor continues striping operations. See Paragraph 516.04(E).

Unless otherwise indicated, all durable pavement marking systems shall provide minimum initial retroreflectivity as specified in Table 516-01. Initial retroreflective readings shall occur no sooner than 30 days after pavement markings have been exposed to traffic. Retroreflectivity measurements are to be taken within a 400-foot evaluation section at the start/end limits and every whole milepost. Average a minimum of 20 retroreflectivity readings per line within the 400-foot evaluation section. Each average for each line will be used to determine a grand average for each line for the length of the project. The grand average of each line will be used to determine compliance. Directional data will be treated independently. See ASTM D7585 Section 920.21 for an example of how to space individual readings. For dry measurements, mobile equipment can be used as a substitute for handheld equipment.

|  |  |  |
| --- | --- | --- |
| **Table 516-01 Average Initial Retroreflectivity at 30-meter Geometry in mcd/m2/lx** | | |
| **Test Method** | **Color** | |
| **White** | **Yellow** |
| Dry (ASTM E1710) | 500 | 300 |
| Wet Recovery (ASTM E2177) | 250 | 200 |

Test the adhesion of the marking no sooner than 30 days after the pavement marking is installed on each line (left edge, broken and/or dotted line(s), right edge) at the start/end limits and every whole milepost using a paint scraper or other approved tool, held parallel with the highway surface. The edge of the material shall be scraped lightly and there shall be no dislodging of the material. Notify the Engineer to witness this procedure. Directional data will be treated independently.

No sooner than 30 days after the pavement markings are installed, inspect the pavement markings for adhesion, color and retroreflectivity; and inform the Engineer in writing of all pavement markings that have failed and require replacement. The adhesion and retroreflectivity testing are to be performed by an agreed upon third party. Provide testing results to the Engineer within 5 days after the measurements are taken. The pavement marking will be considered failed for any of the following conditions:

• The substrate is exposed in any section of longitudinal pavement marking line.

• Inadequate adhesion or delamination as determined by the adhesion testing results.

• Insufficient depth of the groove.

• Retroreflected luminance (RL) levels are below minimum requirements.

• Marking is discolored based on a visual inspection. Color chips provided by the manufacturer will be used to assess discoloring.

1. Thermoplastic Pavement Markings

The Contractor shall apply either preformed or hot extruded/sprayed thermoplastic pavement markings, using equipment and procedures that produce pavement markings that are straight and have sharp edges; that are the specified color, width, and thickness; that have uniform retroreflectivity; and that are properly bonded to the pavement.

Diamond grinding for the applications of recessed thermoplastic traffic stripes shall be at a depth of 100 to 120 mils.

Restriping with thermoplastic may be atop of existing latex, thermoplastic, and epoxy markings when the existing marking system is firmly bonded to existing pavement surface. All other materials except those noted shall be removed prior to placement of thermoplastic markings.

Thermoplastic binder material shall be applied as follows:

1. **Preformed Thermoplastic Binder.**

The Contractor shall place preformed thermoplastic pavement markings on thoroughly dry surfaces and during anticipated dry weather. The preformed thermoplastic markings shall be melted, using the flame from a propane-type torch, according to the manufacturer's recommendations, to bond the pavement markings permanently in position.

The Contractor shall apply additional glass beads and wet reflective optics to the melted binder material in a uniform pattern, to attain the minimum initial retroreflectance value specified in Subparagraph 516.04(A) for thermoplastic pavement markings.

1. **Extruded Thermoplastic Binder.**

Thermoplastic pavement markings shall not be placed on newly constructed pavement until the pavement is a minimum of twenty-four (24) hours old. Refer to 516.04(C) for temporary striping requirements on pavement less than twenty-four (24) hours old.

The Contractor shall heat the thermoplastic binder material uniformly and apply the melted material at a temperature between 400ºF and 440ºF to thoroughly dry surfaces and during anticipated dry weather, when the ambient and surface temperatures are a minimum of 50ºF.

The thermoplastic pavement markings shall be extruded on the bituminous surfaced roadways in a thickness of 90 mils ± 5 mils.

Immediately after, or in conjunction with the thermoplastic application, the Contractor shall apply, by mechanical means, glass beads and wet reflective optics to the wet material in a uniform pattern. Hand throwing of the glass beads and wet reflective optics will not be allowed.

1. **Sprayed Thermoplastic Binder (Restore Pavement Markings).**

Sprayed application of thermoplastic binder shall be limited to restriping activities. the thermoplastic material shall be applied as recommended by the manufacturer in thickness of 35 to 45 mils.

The Contractor shall heat the thermoplastic binder material uniformly and apply the melted material at a temperature between 375ºF and 425ºF to thoroughly dry surfaces and during anticipated dry weather, when the ambient and surface temperatures are a minimum of 50ºF.

Immediately after, or in conjunction with the thermoplastic application, the Contractor shall apply, by mechanical means, glass beads and wet reflective optics to the wet material in a uniform pattern. Hand throwing of the glass beads and wet reflective optics will not be allowed.

1. Epoxy Resin Pavement Markings.

The Contractor shall mix epoxy resin binder material with an automatic proportioning and mixing machine, and hot-spray the compound at a temperature between 100ºF and 130ºF onto thoroughly dry surfaces. The material shall only be placed during anticipated dry weather when the ambient temperature is a minimum of 45ºF and the surface temperature is a minimum of 50ºF. The temperature of the sprayed mixture shall be adjusted as required for prevailing conditions, including the air and pavement surface temperatures, to achieve a no-track drying time of 15 minutes or less. The epoxy resin mixture shall be applied in a wet film thickness of 20 ± 1 mil.

Immediately after, or in conjunction with the epoxy resin application, the Contractor shall apply glass beads and wet reflective optics to the binder in a uniform pattern.

Restriping with epoxy resin may be atop of existing epoxy markings when the existing marking system are firmly bonded to existing pavement surface. All other materials except those noted shall be removed prior to placement of epoxy resin markings.

Epoxy resin pavement markings shall be surface applied, not recessed.

The Contractor shall remove all epoxy resin material that has been tracked or spilled in areas outside of the intended placement areas.

1. Permanent Tape

Permanent tape shall consist of white or yellow films with glass and wet reflective optics incorporated to provide immediate and continuing retroreflection.

Permanent tape pavement markings shall be capable of being adhered to bituminous surfaced roadways and concrete bridge decks and surfaces by a pre-coated pressure sensitive adhesive. The Contractor shall apply a primer to precondition the roadway surface as well as any Manufacturer recommended surface adhesive regardless of seasonal waivers.

Permanent tape shall be capable of application on new bituminous wearing courses during the paving operation in accordance with the manufacturer’s instruction. After application, the permanent tape shall be immediately ready for traffic.

Permanent tape shall consist of a mixture of high-quality polymeric materials, pigments and glass beads and wet reflective optics, distributed throughout its base cross-sectional area, with a reflective layer of ceramic beads bonded to a durable polyurethane topcoat surface.

Longitudinal permanent tape used for striping longer than 50’ shall be scored in 50’ sections.

Restriping with permanent tape pavement markings shall not be atop any existing pavement marking material.

Diamond grinding for the application of recessed permanent tape traffic stripes shall be at a depth of 150 to 170 mils.

Apply the permanent tape and surface preparation adhesive according to the manufacturer’s installation instructions and as directed by the Engineer.

Permanent tape application will require tamping with a vehicle tire. The vehicle must be equipped with a pointing device to aid in keeping the vehicle tire on the permanent tape. Tamp by slowly (40 feet per minute) driving over the permanent tape, making a minimum of six tamping hits all forward passing over the surface of the new permanent tape in the recess. Tire strikes from front and rear wheels when aligned with the aid of a pointing device can be completed in 3 passes. The vehicle and tire used to tamp the tape shall be recommended by the manufacturer and approved by the Engineer. Do not twist or turn the vehicle tire on the tape and make sure all edges are firmly adhered.

1. Contrast Traffic Stripes.

Contrast traffic stripes shall be epoxy resin or permanent tape pavement markings as defined in Subparagraphs 516.04(A)(2) and 516.04(A)(3), as required by the Contract documents or as directed by the Engineer, with a 1.5-inch non-reflective black stripe installed along the perimeter of the reflectorized yellow or white traffic stripe as noted on the contract plans. If using permanent tape, the black stripe may be omitted from the front and rear sides of broken and dotted lane line traffic stripes.

Contrast striping materials and application shall conform to the manufacturer’s specifications.

The markings shall have crisp distinct edges and clean cutoff at the end of each line.

1. Recess Diamond Grinding

The Contractor shall diamond grind bituminous surfaced roadways and concrete bridge decks and surfaces to create a recess for traffic stripes to be installed below the adjacent roadway surface as directed by the Contract documents. Transverse deck grooving on concrete bridge decks and surfaces shall be completed before the diamond grinding for the traffic stripe recess.

The recess dimensions and positioning shall be as follows:

1. The recess width shall exceed the width of the marking material, inclusive of the black markings for contrast traffic stripes, by 1 inch to allow a ½ inch border around the perimeter of the recessed traffic stripe.
2. For broken and dotted lane line traffic stripes, the leading and trailing ends of the recess shall allow a maximum tolerance of 6 inches.
3. The recess depth shall be as directed in 516.04(A) for the specified pavement marking system. Depth of recessing may be adjusted based on the recommendations of the manufacturers of the approved pavement marking system. Where the recessed traffic stripe is to be installed on concrete bridge decks, the tolerance for over-grinding is reduced to zero.
4. The edge of the recess shall be positioned a minimum of 2 inches from the edge of any concrete joints and 4 inches from any bituminous longitudinal pavement joints.

Depth shall be consistent across the full width of the recess. Depth plates shall be provided by the Contractor to the Engineer to assure that desired recess depth is achieved.

Prior to grinding for all recessed lines, the Contractor shall use a chalk line or other suitable method to layout the proposed traffic stripes on the roadway surface so that the Engineer can inspect the locations. Once the Engineer has inspected and approved the proposed traffic striping layout, diamond grinding of the recess may proceed. No recess diamond grinding shall be done without the prior approval of the Engineer.

The recess shall not be installed on bridge joints, on drainage structures, or in other areas identified by the Engineer. The recess shall not be installed continuously for intermittent traffic stripes such as broken or dotted lane lines, but only where pavement markings are to be applied.

Recesses that are out of alignment or ground deeper or wider than the specified allowable limits shall be repaired per the direction of the Engineer at no additional cost. Recesses that are ground too shallow, too narrow, or with unacceptable rises between blade cuts shall be reground to the correct size, depth, and surface finish at no additional cost.

Recesses shall be clean, dry and free of laitance, oil, dirt, grease, paint or other foreign contaminants.

After the depth, width, length, position, and surface condition has been approved by the Engineer, an air lance shall be used to remove fine particles from the recess. Air compressors shall initially be blown out away from the application area to prevent compressor condensation build-up from entering the recess. The Contractor shall prevent traffic from traversing the recesses and re-clean recesses, as necessary, prior to application of the pavement marking system at no additional cost.

Newly placed asphalt shall be allowed to cure for a minimum of 10 days prior to installing recess. On concrete surfaces the transverse deck grooving shall be completed before installing the pavement marking recess.

All recesses must be given final approval by the Engineer prior to the placement of pavement markings.

1. Temporary Pavement Stripes

Temporary pavement striping shall be provided by the Contractor when required per the Plans and provisions of this subparagraph when required for staged construction.

Temporary pavement striping shall be applied in construction work areas, at the locations shown on the Plans, to clean dry surfaces in accordance with the manufacturer’s recommendations including use of primer as approved by the Engineer.

Prior to reopening travel lanes to final traffic conditions, pavement markings shall be reestablished with temporary pavement striping on all newly paved areas less than twenty-four (24) hours old. Temporary pavement striping must be maintained in a serviceable condition in accordance with the various provisions contained herein and subject to the satisfaction of the Engineer until such time as the durable pavement markings are constructed.

Temporary pavement striping shall be 6 inches wide for all locations where the temporary pavement stripe is applied at the same location as the recessed permanent pavement striping to follow, or where the temporary pavement striping is applied within the limits of pavement resurfacing to follow; in all other locations the temporary pavement striping shall 4 inches wide.

The following types of pavement marking systems for temporary pavement striping shall be acceptable, adhering to the below conditions:

1. **Removable Wet Reflective Pavement Marking Tape.**

This shall be used for applications of four (4) days or less.

Removable wet reflective pavement marking tape, meeting the requirements of Subsection 920.10, shall be installed at designated locations under the guidance and in the presence of the manufacturer’s representative, in accordance with the manufacturer’s recommendations. Primers, if required, shall be used to promote tape adhesion to the wearing surface in accordance with the tape manufacturer’s recommendations. The tape shall be white or yellow and shall be installed in single or double lines, as designated.

Removable wet reflective pavement marking tape shall not be overlapped. Only butt splices shall be used and continuous runs of tape shall be scored at 50-foot intervals.

Removable wet reflective pavement marking tape shall be removed when no longer required for traffic control. Removal shall be performed manually, by scraping if necessary, without the use of solvents, burning, grinding, or sand/shot blasting.

1. **Latex Paint Pavement Markings.**

Latex paint may be used for pavement marking applications that will remain in place for longer than four (4) days and shall be reinstalled every thirty (30) days. Latex paint pavement markings shall have a minimum retained coefficient of dry retroreflectance value of 150 mcd/m²/lx. Latex paint shall not be used between October 15 and April 15.

The Contractor shall apply latex paint pavement markings when the ambient and surface temperatures are above 45ºF and rising. The latex paint pavement markings shall be applied in a wet film thickness of 6 ± 1 mil, where markings are required for 14 days or less. The latex paint markings shall be applied in a wet film thickness of 15 ± 1 mil where markings are to be visible to traffic 15 days and beyond, or when markings are to be placed on intermediate pavement layers to be opened to traffic due to staged construction.

The application of the latex paint binder and glass beads, applied separately, including mixing and thinning of the latex paint binder, equipment pressures and operating speed of equipment, shall be in accordance with the material manufacturer's instructions and recommendations. The application of glass beads shall be uniform and shall immediately follow the application of the latex binder.

Wet reflective optics shall not be used with latex paint pavement markings unless noted otherwise in the Contract documents or directed by the Engineer. If wet reflective optics are to be used the thickness of the latex paint shall be adjusted to the appropriate depth to ensure adherence of the optics in accordance with the optic manufacturer's recommendation.

When latex paint pavement markings are required to remain visible beyond 14 days, the Contractor shall apply, before acceptance and when directed, additional applications of latex binder material and glass beads. These applications shall be applied as required by the Engineer and after any sawing or sealing of joints in the HMA overlay.

Reinstallation of latex paint pavement markings may be atop of existing latex paint, thermoplastic, and epoxy pavement markings when the existing pavement marking system(s) are firmly bonded to the existing pavement surface. All other materials except those noted shall be removed prior to placement of latex paint pavement markings.

1. **Thermoplastic Pavement Markings.**

Thermoplastic pavement markings may be used for temporary traffic conditions in lieu of latex pavement markings, based on temperature constraints, as noted on the plans or as directed by the Engineer.

Temporary thermoplastic traffic stripes shall not be placed on newly constructed concrete decks until the decks are a minimum of 24 hours old.

Refer to Subparagraph 516.04(A)(1).

1. **Epoxy Resin Markings.**

Epoxy resin pavement markings may be used for temporary traffic conditions in lieu of latex pavement markings, based on temperature constraints, as noted on the plans or as directed by the Engineer.

Refer to Subparagraph 516.04(A)(2).

1. **Pavement Marking Removal**

The Contractor shall remove all types of pavement markings as directed by methods that do not damage the integrity of the underlying pavement or adjacent pavement areas, and that do not cause gouging, or create ridges or grooves in the pavement that may result in compromising vehicular control. Obliterating markings by painting over them with black paint shall not be permitted except for areas of open grade friction course (OGFC) and where specifically called for in the contract documents or as directed by the Engineer.

Before starting removal operations, the Contractor shall demonstrate the proposed method to accomplish the removal of approximately 100 percent of the marking without the removal of more than 50 mils of pavement thickness. Removal operations will not be permitted until the method of removal has been approved.

Debris from the removal of pavement markings shall be disposed of as directed by the Engineer.

Pavement markings shall be removed before any change is made in the traffic pattern.

The Contractor shall employ mechanical (grinding or sandblasting), hydromilling, or black line mask for obliterating stripes as shown on the Plans. Striping removal operations will not be permitted until the removal method has been tested and approved by the Engineer.

Grinding or Sandblasting shall only be performed on pavement and concrete-wearing surfaces which are scheduled to be replaced.

Hydromilling shall be used in the removal of existing or temporary markings on pavement and concrete-wearing surfaces which are scheduled to remain. The hydromilling system shall be as specified in Subsection 919.51. The area of removal includes the area of the marking plus 1 inch on all sides. Hydromilling shall not be used when the temperature is 35˚F and below.

When black painting of existing pavement markings is permitted, the existing marking shall be kept obliterated for the duration of the work under that stage. Black paint used for obliteration of existing epoxy or latex paint pavement markings shall not be removed and epoxy or latex paint pavement marking will be installed over the black paint. Black paint shall not be used over existing thermoplastic or permanent tape pavement markings. If the existing marking reappear, the black paint shall be reapplied.

Pavement markings shall be removed to the fullest extent possible from the pavement by methods that do not damage the surface texture or result in undesirable variations in color. Sand or other material deposited on the pavement shall be removed as the work progresses. Accumulations of sand or other material which might interfere with drainage or might constitute a hazard to traffic will not be permitted.

Where blast cleaning is performed within 10 feet of a lane occupied by public traffic, the residue including dust shall be removed immediately after contact between the sand and the surface being treated. Such removal shall be by a vacuum attachment operating concurrently with the blast cleaning operation, or by other methods acceptable to the Engineer.

Any damage to the pavement or surfacing, caused by removal of the pavement marking, shall be repaired by the Contractor at his expense by methods acceptable to the Engineer.

For construction durations of greater than 7 days, the Contractor shall cover the existing pavement markings by placing a removable black line mask over them. The removable black line mask shall be applied and tamped in accordance with the manufacturer’s recommendations and any required primer. It shall completely mask the existing pavement markings being covered and extend one inch beyond their edges. The black line mask shall provide a neat, durable masking that must be replaced if it flows, distorts, lifts or shrinks during its use, as directed by the Engineer. When directed, the black line mask shall be removed, and the travel lanes shall revert to their original alignment. Black line mask shall be used for temporary obliteration of existing pavement stripes for staged construction with durations of fifteen (15) days or less. Removable Black Line Mask shall not be overlapped. Only butt splices shall be used. Continuous runs shall be scored at 50-foot intervals.

For lane shifts or traffic detours, when a portion or all of the shoulder is to be used as a traffic lane, the Contractor shall obliterate existing pavement stripes as called for in the plans or as directed by the Engineer and place temporary pavement striping. At the deceleration and acceleration lanes when a portion or all of the shoulder is used as a traffic lane, the Contractor shall remove the pavement markings delineating the auxiliary lane. Upon completion of the work, all pavement markings shall be reinstalled in accordance with the details shown on the Standard Drawings, unless shown differently on the contract plans.

At no cost to the Authority, the Contractor shall remove all temporary pavement markings that will not be directly under durable pavement markings where such markings would be allowed to remain as per the contract documents.

1. **Pavement Marking Acceptance**
2. Determination of Acceptability.

Before starting all pavement marking operations, the Contractor shall construct one or more test strips. Each test strip shall consist of approximately 500 linear feet of pavement with white and yellow traffic stripes (lane and edge lines) or markings similar to that required for the Project. The test strips shall demonstrate the capability of the proposed materials, equipment, and procedures to produce pavement markings that comply with the Specifications, including dimensions, appearance (uniform color and crisp, well-defined edges), wet film thickness, drying time, and retroreflective components application and retention. A test strip will be required for each applicator unit used. Additional test strips may be required when major equipment repairs or adjustments are made or when the pavement markings fail to comply with the Specifications. Permission to proceed with the pavement marking operations will be given when the test strips are in compliance. Each test strip may remain in place and become part of the finished stripes subject to the requirements of Paragraph 516.04(A).

1. Defective Markings.

The Contractor shall replace at no cost to the Authority, installed durable pavement markings determined by the Engineer to be in non-conformance with the Specifications, not placed at the locations or in the dimensions specified, to have an incorrect color, to have failed to bond to the pavement, or to have chipped or cracked.

The Contractor shall replace defective pavement markings based on the following:

1. The entire length of traffic stripe or traffic line shall be replaced if any portion of the stripe or line is determined to have a deficiency as defined herein unless noted otherwise.
2. The entire area of traffic symbol shall be replaced if any portion of the symbol is determined to have a deficiency as defined herein unless noted otherwise.
3. The pavement marking is determined to have a wet film thickness of less than the permissible, based upon the calculated and measured yields.
4. The pavement marking is determined to have improperly cured or a discoloration has occurred. Discoloration is defined as localized areas or patches of brown or grayish colored material. When improper curing or discoloration occurs intermittently in intervals of 100 feet or less throughout the traffic stripe, the entire length of traffic stripe shall be replaced from where it first occurs until where it no longer exists plus 5 feet on each end.
5. The pavement marking is determined to have failed to bond to the pavement or has chipped or cracked. The pavement marking shall be replaced from where it first occurs to where it no longer exists. When more than 25 spots (combined or individual) of chipping, cracking or poor bonding has occurred within a 1,000 linear foot distance, the entire 1,000 linear feet shall be replaced.
6. The pavement marking is determined to have deficient retroreflective component coverage or retention, based on yield determinations made during application and on visual comparisons of the production pavement markings with those of the test strips.
7. The entire 1-mile length of traffic stripe shall be replaced where the minimum initial retroreflectivity value of two of four readings for that 1-mile length of traffic stripe is less than required by Paragraph 516.04(A). Initial retroreflectance for determination of acceptance will be determined as follows:

Step 1: Visual night inspections will be made to identify traffic markings which appear to be below the specified minimum value.

Step 2: All retroreflectance measurements will be made on a clean, dry surface utilizing a portable reflectometer.

Step 3: (a) For word traffic symbols, three random retroreflectance measurements will be made on each letter.

(b) For all other traffic symbols, nine random retroreflectance measurements will be made over the symbol.

Step 4: All retroreflectance measurements within an area will be averaged to determine if the minimum retroreflectance requirements are met.

Remove defective pavement markings in accordance with Paragraph 516.04(D). Obliterating defective markings by black painting over them will not be permitted.

If the Authority determines that emergency repairs are necessary, the contractor shall perform the repairs within 24 hours of notification. If the contractor fails to respond within the 24-hour period, the Authority reserves the right to perform the repairs and will charge the contractor for all costs. The Authority’s determination of costs incurred is final and conclusive.

Removable Wet Reflective Pavement Marking Tape that has become damaged, and is no longer serviceable, in the sole opinion of the Engineer, shall be replaced immediately. Damaged tape that is not replaced immediately may be replaced by the Authority and the costs shall be charged to the Contractor in accordance with Subsection 106.23.

At no cost to the Authority, the Contractor shall replace markings damaged due to any sawing or sealing of joints in the bituminous roadway surface.

Defective pavement markings shall be replaced with the same requirements as the original material; if it is determined that the defect was a result of the pavement system, a different pavement marking system may be used as directed by the Engineer.

Repair or replace other defects not noted above, but determined by the Engineer to need repair, as directed by and to the satisfaction of the Engineer.

1. **Opening to Traffic**

Pavement markings shall be applied, utilizing lane and/or shoulder closings and be thoroughly dry before opening to traffic. The Contractor shall complete each application of all types of pavement markings and allow them to thoroughly dry before opening to traffic. In the event a vehicle should cross the molten pavement marking binder, such pavement markings shall be reapplied, and any tracking of the pavement markings made by the moving vehicle shall be removed at no additional cost to the Authority.

Should ambient and surface temperatures be below the minimums specified for various materials, with approval, pavement markings may be placed at temperatures as low as 35°F in order to open the traveled way to traffic. Placement of durable pavement markings may be delayed for up to seven days after paving. If the application of durable pavement markings will be delayed following the paving operation, temporary markings shall be applied, so that the paved roadway will be marked according to the pavement marking details, prior to opening the roadway to traffic. Temporary traffic markings shall be applied in accordance with Paragraph 516.04(C). The Engineer will determine when the traveled way is to be opened.

516.05 Measurement

Traffic Stripes of the various binder material types will be measured by the linear foot of 6-inch width of yellow or white traffic stripe applied for each binder material type, regardless of color. Widths not equal to 6 inches will be converted to equivalent linear feet of 6-inch width. Gaps in traffic striping will not be measured for payment.

Contrast Traffic Stripes will be measured by the linear foot of 6-inch width of yellow or white traffic stripe applied for each binder material type, regardless of color. Widths not equal to 6 inches will be converted to equivalent linear feet of 6-inch width. The black stripe installed along the perimeter of the yellow or white traffic stripe will not be measured for payment. Gaps in traffic striping will not be measured for payment.

Traffic Lines of the various binder material types for diagonal gore lines, crosswalks, or stop lines will be measured by the linear foot per 6-inch width of traffic line applied for each binder material type, regardless of color. Widths not equal to 6 inches will be converted to equivalent linear feet of 6-inch width. Gaps between traffic lines will not be measured for payment.

Contrast Traffic Lines of the various binder material types for diagonal gore lines, crosswalks, or stop lines will be measured by the linear foot per 6-inch width of traffic line applied for each binder material type, regardless of color. Widths not equal to 6 inches will be converted to equivalent linear feet of 6-inch width. The black stripe installed along the perimeter of the traffic stripe will not be measured for payment. Gaps between traffic lines will not be measured for payment.

Traffic Symbols of the various binder material types will be measured by the square foot for each binder material type, regardless of color. Gaps between, or voids within, traffic symbols will not be measured for payment.

Contrast Traffic Symbols of the various binder material types will be measured by the square foot for each binder material type, regardless of color. The black background installed under the symbol will not be measured for payment. Gaps between, or voids within, traffic symbols will not be measured for payment.

Diamond Grinding will be measured by the linear foot, based on 6-inch width, of recessed traffic stripes installed. Gaps in traffic striping that are not ground will not be measured for payment. Traffic Stripes of widths not equal to 6 inches will be converted to equivalent linear feet of 6-inch width. The additional width of grinding beyond the width of the traffic stipe will not be measured for payment.

Temporary Pavement Stripes will be measured by the linear foot of Latex Paint applied, regardless of the color and width. Temporary Traffic Stripes which are replaced because of damage or excessive wear, as determined by the Engineer, will be measured for payment. Gaps in temporary traffic stripes will not be measured for payment. Durable pavement marking systems used for temporary pavement striping will be measured for payment as Traffic Stripes as defined above.

Removable Wet Reflective Pavement Marking Tape will be measured by the linear foot per 6-inch width of traffic line applied, regardless of color. Widths not equal to 6 inches will be converted to equivalent linear feet of 6-inch width. Gaps in tape will not be measured for payment.

Removable black line mask of the width specified will be measured by the linear foot applied, based on 6-inch width of the existing marking being obscured. Removable black line mask, which is replaced because of damage through no fault of the Contractor, as determined by the Engineer, will be measured for payment. Any Contractor damaged striping or black line mask materials shall be replaced at Contractor expense. The additional width of removable black line mask beyond the width of the existing traffic marking being obscured will not be measured for payment.

Striping and Marking Removal, Hydromilling will be measured by the linear foot of pavement marking removed by hydromilling. Gaps in pavement markings not requiring removal will not be measured for payment.

Striping and Marking Removal, Mechanical will be measured by the linear foot of pavement marking removed by mechanical means (grinding or sandblasting). Gaps in pavement markings not requiring removal will not be measured for payment.

Striping and Marking Removal, Painting will be measured by the linear foot, based on 6-inch width of the marking to be obscured. Widths not equal to 6 inches will be converted to equivalent linear feet of 6-inch width. The amount of paint extending beyond the pavement marking to be obscured will not be measured for payment. Gaps between pavement markings will not be measured for payment.

Restore Traffic Stripes, Thermoplastic; Restore Traffic Lines, Thermoplastic; and, Restore Traffic Symbols, Thermoplastic will be measured as noted for Traffic Stripes, Thermoplastic; Traffic Lines, Thermoplastic; and, Traffic Symbols, Thermoplastic respectively.

516.06 Payment

[Include the following with bridge deck repair Contracts that have local roads requiring MPT due to Contract work:]

Payment will be made under:

***PAY ITEM PAY UNIT***

Traffic Stripes, Epoxy Resin Linear Foot

Traffic Stripes, Thermoplastic Linear Foot

Traffic Stripes, Permanent Tape Linear Foot

Contrast Traffic Stripes, Epoxy Resin Linear Foot

Contrast Traffic Stripes, Permanent Tape Linear Foot

Traffic Lines, Epoxy Resin Linear Foot

Contrast Traffic Lines, Epoxy Resin Linear Foot

Traffic Lines, Thermoplastic Linear Foot

Traffic Symbols, Epoxy Resin Square Foot

Contrast Traffic Symbols, Epoxy Resin Square Foot

Traffic Symbols, Thermoplastic Square Foot

Diamond Grinding Linear Foot

Temporary Pavement Striping Linear Foot

Restore Traffic Stripes, Thermoplastic Linear Foot

Restore Traffic Lines, Thermoplastic Linear Foot

Restore Traffic Symbols, Thermoplastic Square Foot

Removable Wet Reflective Pavement Marking Tape Linear Foot

Removable Black Line Mask Linear Foot

Striping and Marking Removal, Hydromilling Linear Foot

Striping and Marking Removal, Mechanical Linear Foot

Striping and Marking Removal, Painting Linear Foot

Furnishing and installation of glass beads or wet reflective optics will not be measured for payment but shall be considered incidental to the pavement marking and the costs thereof shall be included in the respective pavement marking pay items for application.

Permanent Tape that has become damaged and is no longer serviceable shall be replaced immediately without additional compensation and will not be measured for payment. Permanent Tape that is damaged by construction operations shall also be replaced immediately without additional compensation and will not be measured for payment.

Traffic control for the adhesion and retroreflectivity testing to be performed by an agreed upon third party shall be provided by the Contractor and shall be paid for under the item Furnishing Traffic Control Devices.

No separate payment will be made for black traffic paint used to temporarily obliterate traffic stripes, but the costs thereof shall be included in the pay item(s) for the removal of striping.

Temporary pavement striping constructed on new pavement less than twenty-four (24) hours old, necessary to re-open a staged work area to traffic, will not be measured for payment but shall be considered incidental to the placement of pavement.

No separate payment will be made for the removal of Removable Wet Reflective Pavement Marking Tape or Removable Black Line Mask, but the costs thereof shall be included in their respective pay items for application.

Removable Wet Reflective Pavement Marking Tape that has become damaged and is no longer serviceable shall be replaced immediately without additional compensation and will not be measured for payment. Tape that is damaged by construction operations shall also be replaced immediately without additional compensation and will not be measured for payment. Damaged tape, not replaced immediately, may be replaced by the Authority and the costs shall be charged to the Contractor in accordance with Subsection 106.23.

Section 519 – Toll Booths and DATIM Enclosures

**519.03 Methods of Construction.**

1. **Fabrication.**

Delete the second paragraph and replace it with the following:

Provide the Authority one PDF set of reproducible tracings of complete as-built drawings. For each type of toll booth manufactured under the Contract, the Contractor shall furnish one (1) PDF set of as-built specifications, indicating actual materials employed for the toll booths’ construction. Tracings shall be provided on 22 by 36-inch sheets. The as-built drawings, specifications and tracings shall be furnished to the Engineer at completion of the Project.

[Include the following as necessary:]

Section 520 – Toll Islands

520.02 Materials

Add the following:

Light Fixtures 922.05(B)

Fire Extinguishers and Mounting Brackets 922.05(C)

Stairwell Grating 922.05(A)

Section 522 – Test Pits

522.03 Methods of Construction

Delete the third paragraph, including companies listed (1) through (4).

Section 524 – Impact Attenuator

Delete this Section in its entirety and replace with the following:

524.01 Description

This work shall consist of furnishing and installing re-directive impact attenuators and transitions as identified on the Plans. The attenuator shall be installed as per the manufacturer’s directions and shall include appropriate transitions to longitudinal barrier or dual faced guide rail if present. Non-redirective attenuators shall not be used for a permanent installation; use of non-redirective attenuators for temporary installations shall be as specified under Section 801. Re-directive attenuators may be used in a construction zone on a temporary basis as specified under Section 801.

This work shall also consist of the furnishing and installation of bullnose thrie beam attenuators at wide Z-Turns and other locations shown on the Plans, in accordance with the Authority’s Standard Drawing.

524.02 Materials

Materials shall conform to the following Subsections:

Re-Directive Impact Attenuator 920.20

The attenuator transition shall provide the necessary transition to the longitudinal barrier (beam guide rail, dual faced beam guide rail, or concrete barrier) in accordance with the attenuator manufacturer’s recommendation.

Foundation and additional material requirements shall be in accordance with the attenuator manufacturer’s recommendations. Unless otherwise specified by the manufacturer foundation concrete for the permanent systems shall be at least 4,000 psi. Reinforcement steel shall be epoxy coated. Concrete and reinforcement steel shall conform to Subsection 401.02. Asphalt foundations shall use materials conforming to Subsection 302.02.

Reflective sheeting which appears at the blunt end of impact attenuators shall conform to Subsection 912.02.

524.03 Methods of Construction

Attenuators shall be installed in accordance with the manufacturer’s directions and as indicated on the Plans. Attenuator system designs are independently evaluated for MASH compliance and unless indicated by the attenuator system manufacturer, components from different attenuator systems are not to be interchanged.

The Contractor shall be responsible for preparing the surface on which the attenuator will be installed; this may include constructing a prepared foundation of the type indicated and to the dimensions and grades as shown on the Plans and as required by the attenuator system manufacturer. If a foundation is required, it shall be cured to full strength before exposing the attenuator system to potential impacts. If the attenuator is using a previously constructed foundation, that foundation shall be inspected for deficiencies inadequate slope, signs of cracking, surface wear, shifting from original position, settling, or any other signs of age or deterioration which could make the foundation unusable. Any deficiencies shall be flagged and brought to the Engineer’s attention prior to installation.

Install the attenuator according to the manufacturer’s directions for the type of obstruction being shielded and the type of transition being used. The Contractor shall be certified in accordance with the manufacturer’s requirements to perform installation.

All new material shall be furnished, except where resetting or salvaging is called for on the Plans.

Any damage to the attenuator system caused by Contractor actions shall be immediately replaced/repaired as directed by the Engineer at no additional cost to the Authority.

Some attenuators have features that may allow the attenuator system to be reset with minimal part replacement after an impact. If the Authority directs for an attenuator to be reset, the Contractor shall be familiar with the attenuator manufacturer’s requirements and shall inspect and evaluate the attenuator prior to resetting. A list of any damaged elements to be replaced shall be provided to the Engineer who will make the final determination if the attenuator can be repaired or if a new attenuator should be installed instead. If it is determined by the Engineer that the attenuator is suitable to be repaired and reset, the Contractor shall replace all damaged elements with new elements prior to resetting the attenuator. Upon resetting the attenuator, and prior to exposing the attenuator to traffic, a final inspection shall occur to ensure that the attenuator conforms to the attenuators manufacturer’s requirements.

524.04 Measurement

Impact Attenuator (Cartridge), \_\_\_Bays, \_\_\_” Wide shall be measured by the number of each installed. Each unit shall consist of a total energy absorbing system composed of the required number of bays and required width.

Impact Attenuator, Type\_\_\_\_\_ will be measured by the number of each installed.

Bullnose Thrie Beam Attenuator will be measured by the number of each installed.

Repair and Reset Impact Attenuator, Type \_\_\_\_\_ and Repair and Reset Impact Attenuator (Cartridge), \_\_\_Bays, \_\_\_” Wide will be measured by the number of each impact attenuator unit repaired and reset.

For re-directive impact attenuators installed on a temporary basis see Section 801.

524.05 Payment

Payment will be made under:

PAY ITEM PAY UNIT

Impact Attenuator (Cartridge), \_\_\_ Bays, \_\_\_” Wide Each

Impact Attenuator, Type \_\_\_\_ Each

Bullnose Thrie Beam Attenuator Each

Repair And Reset Impact Attenuator (Cartridge), \_\_ Bays, \_\_” Wide Each

Repair And Reset Impact Attenuator, Type \_\_\_\_\_ Each

No separate payment will be made for concrete, anchors, concrete foundations, epoxy coated reinforcement, reflective sheeting, or transitions to longitudinal barrier, but the costs thereof will be included in the unit prices bid for the various impact attenuator pay items in the Contract.

No payment will be made for repair or replacement of impact attenuators damaged by the Contractor’s operations.

Section 530 – Raised Pavement Markers

Delete this Section in its entirety:

Section 533 – Thermoplastic Rumble Strips

533.02 Materials

Delete the entire Subsection and replace it with the following:

Materials shall conform to the following Subsections:

Thermoplastic Rumble Strips 923.49

Add the following Section:

**Section 534 – Trenchless Installation of Underground Facilities**

534.04 Methods of Construction

1. **Connections**

Delete the fourth paragraph in its entirety and replace with:

All other connections shall satisfy the requirements of Subsection 923.08 and be performed in accordance with the certified SSWP.

Add the following Section:

Section 535 - Concrete Barrier Curb, Precast

535.01 Description

This work shall consist of the furnishing and installation of precast concrete barrier curbs on bridges and on their approaches at locations shown on the Plans and as described herein.

535.02 Materials

All reinforcing steel shall be epoxy coated and shall conform to Subsection 915.01.

The tie wire shall be 16 gage or heavier, black annealed wire.

Bar supports shall conform to the CRSI Manual of Standard Practice, "Bar Supports for Epoxy-Coated Reinforcing Bars".

Reinforcing steel shall be protected at all times from damage and shall be stored above ground level. Cut ends of bars and areas of the epoxy coating which are damaged during fabrication, handling and installation shall be coated with an epoxy repair material, in accordance with ASTM D 3963. The epoxy repair material shall be compatible with the shop coating and inert in concrete.

Reinforcing bars to be embedded in concrete shall be free of oil, dirt, and other foreign substances.

Anchor rods shall be fully threaded and shall conform to the requirements of ASTM A 325. Each anchor rod shall be furnished with Heavy Hex Nuts, ASTM A 563, Grade DH (lubricated) and Hardened Washers, ASTM F 436, Type 1. Each component shall be hot dip zinc coated in accordance with ASTM A 153. Steel anchor plates shall conform to the requirements of ASTM A 709, Grade 36 and shall be hot dip zinc coated in accordance with ASTM A 123.

The adhesive anchoring system for the anchor rods shall be Magnabond Anchoring Resin as manufactured by A&P Foglia, Inc., East Brunswick, NJ 08816 (telephone 908-821-8738); HIT HY 150 Injection Adhesive Anchor as manufactured by Hilti, Corp., Tulsa, OK 74121 (telephone: 800-879-8000); or approved equal.

The concrete shall have a minimum 28-day compressive strength of 5,000 psi.

Portland cement shall conform to ASTM C 150, Type I, II or III. Different brands of cement, the same brand of cement from different mills or different types of cement shall not be mixed. Suitable means shall be provided for storing and protecting the cement against dampness. Cement which for any reason has become partially set or which contains lumps of caked cement will be rejected. The temperature of the cement at the time of delivery to the mixer shall not exceed 160 degrees F.

Admixtures and curing materials shall conform to Section 905.

The use of liquid membrane-forming compound is prohibited for the concrete work in this section. Only white polyethylene/burlap sheeting shall be used for curing the concrete.

* The fine and coarse aggregates for the concrete shall consist of natural sand and natural gravel conforming to ASTM C 33.
* The aggregate particles shall be clean, hard, tough, durable, of uniform quality, free from soft pieces, disintegrated stone, dirt, organic or other injurious materials occurring either free or as a coating. In addition, elongated particles having length to width ratios in excess of 3:1 shall not constitute more than one (1) percent of the total number of particles.
* The maximum allowable limits for deleterious substances in the fine aggregate are:

|  |  |
| --- | --- |
| Table 535-1 Maximum Limits for Fine Aggregate | |
| Type | Maximum (%) |
| **Clay lumps and friable particles** | **3.0** |
| **Material finer than #200 sieve** | **3.0** |
| **Coal and lignite** | **0.5** |

* The maximum allowable limits for deleterious substances in, and physical property requirements of, the coarse aggregate are:

|  |  |
| --- | --- |
| Table 535-2 Maximum Limits for Coarse Aggregate | |
| Type | Maximum (%) |
| **Clay lumps and friable particles** | **3.0** |
| **Chert (less than 2.4 specific gravity SSD)** | **3.0** |
| **Sum of the above two** | **3.0** |
| **Material finer than #200 sieve** | **1.0** |
| **Coal and lignite** | **0.5** |
| **LA Abrasion** | **50** |
| **Magnesium Sulfate Soundness (5 cycles)** | **18** |

Note: If sodium sulfate soundness test is used in lieu of the magnesium sulfate soundness test, the maximum allowable limit is twelve (12) percent.

* The sources of the fine and coarse aggregates shall be identified and submitted with representative samples in accordance with ASTM D 75 to the Engineer for approval.
* The gradation of the fine and coarse aggregate shall be as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| Table 535-3 Gradation of Fine and Coarse Aggregates | | | |
| Fine Aggregate | | Coarse Aggregate | |
| Sieve Size | % Passing | Sieve Size | % Passing |
| 3/8 in. | 100 | 1 in. | 100 |
| #4 | 95-100 | 3/4 in. | 90-100 |
| #8 | 80-100 | 3/8 in. | 20-55 |
| #16 | 50-85 | #4 | 0-10 |
| #30 | 25-60 | #8 | 0-5 |
| #50 | 10-30 | - | - |
| #100 | 2-10 | - | - |

The minimum percentage of coarse aggregate by weight of total aggregate shall be 60 percent.

The concrete leveling course for precast barrier curbs shall conform to the requirements above, with the exception that the maximum size of the coarse aggregate shall be 3/4 inch. The color of the concrete leveling course shall be gray.

Mortar and grout shall conform to Section 905. The Portland cement for the mortar and grout shall be the same brand and type and shall be from the same mill as the cement used for the barrier curb concrete. For precast barriers the cement shall be supplied by the precasting plant. The color of the mortar and grout shall match the color of the barrier curb. Mortar bedding for precast barriers shall be epoxy mortar.

The concrete mix design shall conform to the following:

The Contractor shall develop a concrete mix design in a qualified and approved testing laboratory which meets the requirements of ASTM E 329. The concrete mix designs shall be proportioned in accordance with ACI 211.1 and this Specification. The mix design proposed for use, when tested in the laboratory prior to the construction, shall have a 28-day average compressive strength of no less than 5,700 psi and a minimum strength of no less than 5,000 psi. The cement content shall be at least 7.0 bags (658 lbs.) per cubic yard. The concrete shall be proportioned to produce a slump of 1-2 inches without exceeding a water-cement ratio of 0.40. This slump requirement applies to the concrete prior to the addition of water-reducing (WR) or high-range water-reducing (HRWR) admixtures. The addition of WR or HRWR admixture to the concrete shall result in a slump of 5-8 inches.

If ready-mixed concrete is used, the specified slump of 1-2 inches shall apply to the concrete when it arrives at the job site. The WR or HRWR admixture shall be introduced into the ready-mix truck drum at the job site and incorporated into the concrete by 60-80 revolutions of the drum at mixing speed, just prior to discharging the concrete into the forms. The specified slump of 5-8 inches shall apply to the concrete as it is deposited into the forms.

If precast concrete barrier curbs are cast at a precasting yard using its own batch plant, the Contractor shall submit to the Engineer for review a detailed outline of the mixing and transporting procedures at the plant. Based on this review, the Engineer will determine the stages of the operation where the two slump requirements shall apply. However, the WR or HRWR admixture shall be incorporated into the concrete by mixing for at least one (1) minute.

The entrained air content, measured according to ASTM C 231, shall be 7 ± 2 percent. This requirement applies to the concrete after the addition of WR or HRWR admixture.

Whenever the temperature is above 80 degrees F, the Contractor shall provide, as approved by the Engineer, an approved admixture to be added to the concrete for retarding the initial set of the concrete. The admixture shall be used in strict conformance with the manufacturer's recommendations.

1. Testing the Concrete Mix Design

Sampling and testing shall be performed in accordance with the applicable tests listed in Subsections 901.20, 905.05 and 914.04, and the following.

The following shall be submitted to the Engineer:

* Certification of Compliance in accordance with Subsection 106.04 for the aggregate requirements as specified in Subsection 501A.04, Subpart D.
* Proportions of all material, including proposed admixtures.
* Certificate of Compliance in accordance with Subsection 106.04 for the cement.

The Engineer will be witness to the following:

* Slump and air-content during laboratory tests, before and after the addition of WR or HRWR admixture.
* The mixing of the cylinders for 7 and 28-day compressive strength tests (minimum three (3) cylinders for each test). The cylinders shall be delivered to the Engineer for testing.

1. Joint Sealer Material Requirements

Elastic joint sealer shall conform to Subsection 518.02 (e). Other materials shall conform to the following Subsections:

Preformed Bituminous Joint 907.01

Hot-poured and Cold-applied Joint Sealers 907.02

1. Material Submittals

All submittals shall be made at least four weeks prior to actual production of the barrier curbs or parapets. Before construction of the barrier curbs or parapets commence, the Contractor must submit and obtain approval of the following:

* Concrete mix design;
* Source of materials;
* Manufacturers' product data sheets for all admixtures intended for use in the concrete;
* Description of the intended batching, mixing, transporting and placing procedures;
* Form release agent's: product trade name and laboratory certification of compatibility with silane penetrating sealers;
* Mill test reports at least one week prior to placing (or shipping to the job site) the reinforcing steel; and
* Working drawings including reinforcing bar order lists and bending diagrams in conformance with ACI 315 and Subsection 105.04.
* Manufacturer's mill test reports of the adhesive anchoring system.
* Contractor's testing procedure for proof loading of the adhesive anchoring systems installation.

1. Material Quality Assurance

All materials used in constructing the barrier curbs and parapets shall conform to the following reference standards.

* American Society for Testing and Materials:
  + Practice for Making and Curing Concrete Test Specimens in the Field (ASTM C 31)
  + Specification for Concrete Aggregates (ASTM C 33)
  + Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete (ASTM C 42)
  + Specification for Ready-Mixed Concrete (ASTM C 94)
  + Test Method for Slump of Hydraulic Cement Concrete (ASTM C 143)
  + Specification for Portland Cement (ASTM C 150)
  + Specification for Sheet Materials for Curing Concrete (ASTM C 171)
  + Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method (ASTM C 231)
  + Specification for Air-Entraining Admixtures for Concrete (ASTM C 260)
  + Specification for Chemical Admixtures for Concrete (ASTM C 494)
  + Practice for Use in the Evaluation of Testing and Inspection Agencies as used in Construction (ASTM E 329)
  + Specification for Deformed and Plain Billet Steel Bars for Concrete Reinforcement (ASTM A 615)
* American Concrete Institute:
  + Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete (ACI 211.1)
  + Guide Practice for Measuring, Mixing, Transporting and Placing Concrete (ACI 304R)
  + Standard Specification for Cold Weather Concreting (ACI 306.1)
  + Hot Weather Concreting (ACI 305R)
  + Building Code Requirements for Reinforcing Concrete (ACI 318)
  + Standard Practice for Curing Concrete (ACI 308)
  + Guide Practice for Consolidation of Concrete (ACI 309R)
  + Identification and Control of Consolidation-Related Surface Defects in Formed Concrete (ACI 309.2R)
  + Details and Detailing of Concrete Reinforcement (ACI 315)
* Concrete Reinforcing Steel Institute:
  + Manual of Standard Practice

535.03 Equipment

Equipment shall be in accordance with Section 401.

Only metal forms shall be used for precast barrier curbs and parapets, and they shall conform to the applicable provisions of Section 401 except as amended herein.

535.04 Methods of Construction

Construction of the concrete barriers and parapets shall conform to the provisions of ACI 304 and ASTM C 94 except as amended in these Specifications.

1. Reinforcing Steel Fabrication

Fabrication of reinforcing steel shall conform to the following.

* Detailing dimensions for hooks and bends shall be in accordance with the ACI standard "Details and Detailing of Concrete Reinforcement" (ACI 315).
* Reinforcing bars shall not be bent or straightened in a manner that will injure the steel or the epoxy coating.
* Reinforcing bars shall conform accurately to the dimensions shown on the Plans and within the fabrication tolerances as shown in ACI 315.

1. Placement of Reinforcing Steel

Placement of reinforcing steel shall conform to the following.

* The reinforcing steel shall be accurately placed as detailed on the Plans and securely held in place in the forms during the placing of concrete.
* The minimum clear concrete cover over all reinforcing steel shall be two (2) inches unless otherwise noted on the Plans.
* Reinforcing steel shall be placed within the tolerances given in ACI's Standard Specifications for Tolerances for Concrete Construction and Materials (ACI 117).

1. Casting Methods

Casting methods for precast and cast-in-place concrete barriers shall be as follows:

* Precast in a precasting plant using its own batch plant.
* Precast using ready-mixed concrete.
* Cast-in-place using ready-mixed concrete.

The use of concrete mobile or slipforming will not be permitted.

1. Batching, Mixing and Delivery

All concrete, regardless of whether ready mixed, or mixed in a central batch plant at a precasting plant, shall be batched and mixed in accordance with the requirements of ASTM C 94.

|  |  |
| --- | --- |
| Table 535-4 Batch Measurement Accuracy | |
| Material | Accuracy (%) |
| Cement | ±1 |
| Coarse Aggregate | ±2 |
| Fine Aggregate | ±2 |
| Total Weight of Aggregate | ±2 |
| Water | ±1 |
| Admixtures | ±3 |

The Engineer will be made present at the time of verification batching to confirm that the preparations and ingredients batched are in accordance with the proposed mix design.

The materials for each batch of concrete shall be measured within the following accuracies.

The mixing of the concrete shall be such as to assure compliance with the following uniformity requirements, expressed as maximum permissible difference in results of tests of samples taken from two widely separated locations in the batch:

|  |  |
| --- | --- |
| Table 535-5 Concrete Uniformity Requirements | |
| Material | Maximum Permissible Difference |
| Weight per cubic foot | 1.0 lbs./ft3 |
| Air Content | 1.0% |
| Slump before addition of WR or HRWR | 1.0 in. |
| Coarse aggregate content, portion by weight of each sample retained on No. 4 | 6.0% |
| Average compressive strength at seven (7) days for each sample, based on average strength of all comparative test specimens | 7.5% |
| Weight per cubic foot | 1.0 lbs./ft3 |

The concrete mixers may be stationary or truck mixers.

Stationary mixers, when used for the complete mixing of the concrete, shall be equipped with an acceptable timing device that will not permit the batch to be discharged until the specified mixing time has elapsed.

When a truck mixer is used, each batch of concrete, before the addition of WR or HRWR admixture, shall be mixed for not less than 70 nor more than 100 revolutions of the drum at the rate of rotation designated as mixing speed by the manufacturers of the equipment.

When ready-mixed concrete is used, the truck mixer shall be equipped with a tank for the HR or HRWR admixture and an automatic dispensing system which introduces this mixture at the job site in the required amount. The concrete subsequently shall be mixed for 70 revolutions of the drum at mixing speed.

When ready-mixed concrete is used, after the introduction of the mixing water to the cement and aggregates or the introduction of cement to the aggregates, discharge of the concrete shall be completed within 1 1/2 hours, or before the drum or agitators have revolved 300 revolutions, whichever comes first.

1. Placing Concrete

Prior to construction of barrier curbs, the existing decks shall be repaired, if and when directed by the Engineer, in accordance with Section 417.

Through deck anchor bolts for precast barrier curbs, shall be set in core drilled holes in bridge decks. Air drilling of holes through deck slabs will not be permitted. Partial depth holes into decks and in wingwalls for anchor bolts or for reinforcing steel dowels for cast-in-place barrier curbs and parapets may be air drilled. Prior to drilling holes in the deck, the Contractor shall locate the existing deck reinforcing steel by means of a Pachmeter, and shall locate the holes so as to clear the existing reinforcing steel.

Anchor bolts and reinforcing steel dowels shall be set in the drilled holes with an epoxy grout or an adhesive anchor system. Preparation and installation of the anchor bolts and/or dowels with the grout or adhesive shall be in strict conformance with the grout or adhesive manufacturing specifications.

Anchor bolts which are installed with an adhesive anchor system shall be proof loaded to 35,000 pounds. The testing shall be unrestrained and in accordance with ASTM E 488. The anchor bolts tested shall be randomly chosen and the number of bolts tested shall be equal to the cube root of the total number of the anchor bolts installed.

All anchor bolt nuts shall be tightened with a calibrated torque wrench to produce 50 percent of the allowable tensile value of the anchor bolts.

Reinforcing steel dowels installed with an adhesive anchor system shall be proof loaded to 90% of their yield strength. The testing shall be unrestrained and in accordance with ASTM E 488. The dowels tested shall be randomly chosen and the number of dowels tested shall be equal to five (5) of the first 50 dowels installed plus the cube root of the remaining dowels installed.

Before placing concrete, all equipment for placing and conveying the concrete shall be cleaned, and vibrators shall be check for workability. All frost, ice, mud, debris and water shall be removed from the forms, and the forms shall be thoroughly wetted or oiled. The reinforcement shall be securely tied in place and thoroughly cleaned of ice or other coatings which may destroy or reduce bonding with the concrete. No concrete shall be placed until the Engineer has approved the forms, and the condition and placement of the reinforcement.

Conveying the concrete from the mixer to the place of deposit shall not cause separation or loss of materials. Placing of the concrete shall be such that it shall be deposited as nearly as possible in its final position to avoid segregation due to rehandling or flowing. The concrete shall not be distributed horizontally with the vibrators. Placing shall be at such a rate that at all times the concrete shall be plastic, and flow readily into the corners of the forms and into spaces between reinforcement. No concrete that has partially hardened or has been contaminated by foreign materials shall be deposited in the forms. When concreting is commenced, it shall be carried out as a continuous operation until a full section is completed. Cold joints will not be permitted within the individual sections. When being deposited, the concrete shall not be allowed to fall a vertical distance greater than four (4) feet from point of discharge to the point of deposit.

All newly placed concrete shall be consolidated by means of both internal and external vibrators. The use of trac-type form vibrator is preferred and strongly recommended for cast-in-place concrete. External vibrators shall have operating frequencies in the range of 300 to 6,000 rpm and internal vibrators shall run at a minimum speed of 7,000 rpm. Extra vibrators shall be kept at the Project site for back-up as necessary. The vibrating shall be done in such a manner as to avoid displacement of the reinforcement.

1. Finishing and Curing Concrete

After the concrete has been placed and consolidated in the forms, the exposed surface of the concrete shall be struck with a straight edge and the struck surface shall be given a smooth, uniform magnesium float finish.

All concrete shall be maintained above 50 degrees F and in a moist condition until it has reached a compressive strength of at least 3,000 psi, as determined by testing of sets of three (3) cylinders cured at the Project site, but under no circumstances for less than three (3) days. Moisture shall be retained in the cast concrete by continuous mist from soaker hoses or by the use of white polyethylene/burlap sheeting wetted daily.

The use of liquid membrane-forming curing compound is prohibited.

After the concrete has attained a strength of 3,000 psi and moist curing has been discontinued, the concrete shall not be exposed to temperatures below the freezing point for three (3) days.

Placement and curing of the concrete during hot weather shall conform to the requirements of ACI 305R.

Placement and curing of the concrete during cold weather shall conform to the requirements of ACI 306.1.

1. Placement of Precast Concrete Barrier Curbs

The top surface of the concrete leveling course beneath the precast barrier curbs shall be intentionally roughened to a full amplitude of approximately 1/4 inch. The leveling course shall be continuously moist cured for not less than three (3) days.

Precast sections of barrier curb shall be lifted and placed using a two-point pick-up to avoid unnecessary stress in the concrete. Lifting inserts shall be recessed and all other lifting devices shall be removable. The recessed holes shall be filled with grout after the barrier is placed and the lifting devices removed.

Precast barrier curb sections shall be placed on an epoxy mortar bed having a plastic consistency. The mortar bed shall be a minimum depth sufficient to fill any voids and irregularities between the base of the barrier curb and the leveling course, and to bring the barrier curb to proper line and grade.

After the anchor bolts are properly installed and tested in accordance with Subsection 501A.18, the recesses for the anchor bolts shall be filled with non-shrink grout (non-epoxy).

1. Field Quality Assurance

The testing of the concrete will be as follows:

* The Engineer will test the fresh and hardened concrete.
* The temperature of the concrete at discharge and the temperature of the ambient air will be measured.
* Slump will be measured before and after the addition of WR or HRWR admixtures, and the air-content will be measured after the addition of the WR or HRWR admixtures.
* If the slump or air-content of the first batch mixed on each day of casting do not comply with the requirements, the batch will be rejected. If rejected, slump and air-content tests will be made on subsequent batches until the concrete complies with the requirements.
* Sets of slump and air-content measurements will be made on two additional batches spaced evenly during each day's pour.
* For each testing load, two sets of six (6) concrete cylinders (6 inches by 12 inches) will be cast. After one day of field moist curing, six (6) cylinders will be transferred to the laboratory for moist curing. Compressive strength testing will be performed on three (3) laboratory cured cylinders at seven (7) days of age and three (3) at 28 days.
* A set of three (3) field-moist cured test cylinders will be tested in compression at three (3) days of age. If the average strength of these three (3) cylinders is higher than 3,000 psi, the moist curing of the concrete represented by the cylinders may be discontinued. If the average compressive strength of the three (3) test cylinders is less than or equal to 3,000 psi, the moist curing shall continue as follows:

|  |  |
| --- | --- |
| Table 535-5 Three-Day Field Strength Testing | |
| Average 3-day Field Strength | Extend Curing for: |
| 2,800 - 3,000 psi | 1 Day |
| 2,600 - 2,800 psi | 2 Days |
| 2,400 - 2,600 psi | 3 Days |

* After the extended moist curing period given in the above table, the three (3) remaining field cured test cylinders shall be tested in compression. If the average result of these tests is at least 3,000 psi, the curing may be discontinued. If the average compressive strength of these cylinders is less than 3,000 psi, the concrete may be rejected.
* Each test report will contain, as a minimum, the following information for each set of cylinders:
  + Test number;
  + Portion of barrier curb or parapet represented by the cylinders;
  + Date cast;
  + Curing condition;
  + Dates tested;
  + Specified concrete properties;
  + Compressive strength of each individual cylinder;
  + Slump, before and after the addition of the WR or HRWR admixtures;
  + Air content;
  + Concrete and air temperature; and
  + Notification if the concrete is not in conformance with the Specifications.
* The concrete shall be considered satisfactory if the average field strength, determined as specified in F, G, and H above, is at least 3,000 psi at the time of discontinuation of moist curing and the average strength of three (3) cylinders, cured moist for 28 days in the laboratory is at least 5,700 psi and no value is less than 5,000 psi.

1. Joint Sealing

The Contractor shall seal the joints between barrier curb sections in accordance with the details shown on the Plans and as directed by the Engineer. Preparation and installation of the joint sealers shall be in accordance with the joint sealer manufacturer's recommended procedures and specifications.

Installation of the Elastic Joint Sealers in open joints at the abutments and/ or piers shall be in accordance with the manufacturer’s recommendations.

1. Associated Work

This work shall also include the following associated work: the removal of bituminous overlay adjacent to the existing bridge safety walks and curbs, installation of membrane waterproofing adjacent to the new barrier curb in accordance with Section 417, placement of bituminous concrete overlay adjacent to the new barrier curb in accordance with Section 302, and repairs to the deck slab in accordance with Section 417. Except for deck repairs, all costs for associated work will be included in the pay item Concrete Barrier Curb, Cast-in-Place.

535.05 Method of Measurement

Concrete Barrier Curb will be measured by the linear foot, along the face at the gutter line. Included in this linear foot cost will be all incidental work and materials necessary including but not limited to grey concrete leveling course, reinforcing steel, anchor bolts, mortar bed, joint sealers, adjacent waterproofing and bituminous concrete overlay.

535.06 Basis of Payment

Payment will be made under:

PAY ITEM PAY UNIT

Concrete Barrier Curb, Precast Linear Foot

Temporary shielding will not be measured for payment.

No separate payment will be made for removal of railings and demolition of safety walks.

Payment for deck repairs will be made in accordance with Section 417.

No separate payment will be made for elastic joint sealer in open joints in barrier curbs which are installed in conjunction with adjacent asphaltic plug joints. All associated cost will be included in the pay item Asphaltic Plug Joint in accordance with Section 417.

[Include the following as necessary:]

The following Section is added:

Section 536 - Public Utilities In Structures

536.01 Description

This work shall consist of the construction of gas and water mains on bridges.

536.02 Materials

Materials shall conform to the following Subsections:

Fiberglass Pipe 917.06

Bolts and Bolting Material 909.02

Structural Steel 909.01

Timber for Structures 910.01

Gaskets 923.12

Steel pipe sleeves shall conform to ASTM A 252 and shall be galvanized according to ASTM A 123.

Channel supports, rods, bolts, nuts, washers, inserts, and other hardware required for the permanent installation shall be hot‑dip galvanized according to ASTM A 123 or A 153.

Gas or water mains shall conform to the following:

1. Gas Mains

Pipe, pipe sleeves, pipe hanger assemblies, expansion joints, and seals between the pipe and sleeves shall be furnished by the gas company. Pipe, in 20 foot or longer lengths, shall be delivered to the job site, by the gas company, close to the point where it is to be used.

1. Water Mains

Materials shall be as provided in the Supplementary Specifications.

536.03 Methods of Construction

1. Gas Mains

The gas company shall be notified at least three working days in advance of when pipe delivery is required. The pipe shall be unloaded at the delivery point and shall be moved into place on the structure and joined together by welding. The gas main shall terminate approximately 5 feet beyond the abutments at each end of the bridge structure. Expansion joints shall be installed in the main as instructed by the gas company representative. Structural shapes and plates for utility supports shall conform to Section 403.

Before welding, the pipe shall be aligned on the common axis, properly gapped and firmly held by a welding clamp. All welding areas shall be cleaned to a bright metal surface by wire brushing or grinding. The first or stringer bead shall be deposited at least 50 percent around the circumference in equally spaced segments before the weld clamp is removed. Before applying the next pass, all tack welds and each bead shall be cleaned free of scale and oxide.

Welding shall conform to the manual arc welding procedure according to API 1104 ‑ Standard for Field Welding of Pipe Lines and Related Facilities. Welders shall be qualified under API 1104 standards.

All welds shall be examined by radiographic (X‑ray) inspection by a qualified inspection company acceptable to the gas company. The welds shall be accepted only if they meet API 1104 standards of acceptability. The X‑ray films and one copy of the radiographic inspection report are to be delivered to the gas company. Defective welds shall be removed from the line and the pipe rebeveled by grinding and rewelded. Repair welds also shall also be inspected radiographically according to the provisions of this Paragraph.

Before sections of pipe are welded together, each length shall be cleaned by passing a fiber and wire pipe brush of proper size through it.

Hangers shall be adjusted to provide uniform support of the pipe across the bridge and to align it in the abutment sleeves.

Upon completion of the installation, the carrier pipe shall be given a bottle test with air, for 24 hours, at a pressure specified by the gas company with test caps and gauges supplied by the gas company. Caps or expansion joints, if used, shall be anchored to prevent movement during the test. The method employed to anchor caps and expansion joints is subject to approval of the gas company inspector.

After completion of the test and relieving the test pressure, anchoring devices shall be removed as directed by the gas company inspector.

The pipe and hanger supports shall be cleaned and painted according to gas company specifications. Copies of these specifications are available upon written request to the gas company.

The installation of gas mains is subject to inspection and approval of the utility company.

1. Water Mains

The construction of water mains shall be according to the provisions in the Supplementary Specifications.

536.04 Measurement

Utility conduits and mains will be measured by the linear foot including the length projecting beyond the rear face of the abutment.

536.05 Payment

Payment will be made under:

PAY ITEM PAY UNIT

\_\_\_\_” Gas Mains Linear Foot

\_\_\_\_” Water Mains Linear Foot

[Include the following with bridge deck Contracts:]

The following Section is added:

Section 537 – Micro-Milling Of Concrete Deck Surface

537.01 Description

The work shall include the removal of the ¼” sacrificial thickness off the surface of the finished concrete deck to produce a smooth and uniform riding surface as indicated in the Contract Plans.

The work shall also include evaluating the deck riding surface smoothness, as well as performing the deck grinding and all measurements described herein to evaluate the adequacy of deck riding surface.

The Contractor shall employ micro-milling procedures that will produce an average profile index of 12 inches per mile or less. Local area indexes up to 15 inches per mile may be accepted.

537.02 Materials and Equipment

No Materials specified.

A power driven, self-propelled machine having diamond blades and capable of grinding the surfaces of the concrete to the specified smoothness tolerances shall be used. Equipment that will cause strain or damage to the deck surface, excessive ravels, aggregate fractures, spalls, or disturbance of transverse or longitudinal joints shall not be used.

Use equipment having gang-mounted diamond saw blades on a multiblade arbor specifically designed for Portland Cement Concrete pavement production grinding. Use equipment capable of producing a 3 foot (minimum) grinding pass width that is equipped with a vacuum system capable of removing slurry from the pavement surface as approved by the Engineer. Submit requests to use other equipment at least 7 days before grinding.

537.03 Methods of Construction

Diamond Grinding. Begin and end diamond grinding at lines normal to the pavement centerline. Grind the pavement longitudinally such that at least 95% of the pavement surface is diamond ground and the pavement is in the same plane across a joint or crack when measured with a 3 foot (minimum) straightedge. Provide surface drainage by maintaining the proper cross slope on the finished surface and by blending adjacent passes. Regrind the pavement if an acceptable surface is not being obtained.

Continuously remove the slurry from the pavement using the vacuum system on the grinding equipment. The Contractor shall transfer the slurry into equipment capable of transporting it from the job site without spills.

In any case, do not allow slurry discharge into:

* Occupied travel lanes.
* Drainage structures.
* Wetlands, streams, estuaries, or sensitive environmental resources identified in the Contract documents.
* Areas where it will become a public nuisance.

Dispose of slurry in conformance with all Federal, State, and local regulations.

Regardless of the overall surface conformity of the bridge deck, if surface deviations have a detrimental effect on deck drainage or reinforcement steel cover, appropriate remedial measures to restore any or all of the deck slab surface to the required grades and surface tolerance will be ordered. When such remedial procedures are ordered, a plan shall be submitted, setting forth the intended limits of the surface restoration and a complete description of the methods, equipment and materials proposed for use.

Following satisfactory completion of the surface restoration measures to the bridge deck slab, the affected area shall be retested.

Additional compensation, Extension of Contract Time or other concessions will not be granted for any surface restorations ordered by the Engineer for compliance with the Specification.

1. Micro-Milling

Based on the profilograph measurements obtained during each construction stage, the Contractor shall determine the optimal micro-milling depth at all points of the roadway surface, with appropriate allowance for the subsequent 0.25 inch deep transverse saw cut grooves.

1. Surface Smoothness Measurements

Upon completion of micro-milling, the bridge deck riding surface shall be tested and corrected in accordance with the Subsection 401.12(D).

Prior to profilograph measurements, all objects and equipment shall be removed from the bridge deck surface and the surface shall be vacuumed clean of any debris. An average profile index for the entire bridge length will be determined by the Contractor and recorded as the initial profile index.

When the profile index exceeds 12 but does not exceed 15 inches per mile, the Engineer may direct the Contractor to reduce the profile index through corrective grinding. There will be no additional payment for the work involved in any “must grind” bump removal or profile index corrective grinding.

537.04 Surface Finish

Immediately after micro-milling of the bridge deck surface and any corrective work is complete, the bridge deck shall receive a saw-cut groove finish per Part 401.17(F)(3).

537.05 Measurement

Micro-Milling Deck Surface will be measured by the surface area of bridge deck milled as prescribed.

Ride Quality Testing for Micro-Milled Deck Surfaces will not be measured for payment but will be made on a lump sum basis. The work shall include all costs associated with testing the ride quality of the micro-milled surface. No additional measurement will be made for retesting.

No separate measurement shall be made for vacuum systems to collect and discharge residue and slurry, but shall be included in the item “Micro-Milling Deck Surface”.

537.06 Payment

Payment will be made under:

PAY ITEM PAY UNIT

Micro-Milling Deck Surface Square Yard

Ride Quality Testing for Micro-Milled Deck Surfaces Lump Sum

No separate payment will be made for grinding deck or other corrective action. No separate payment will be made for the vacuum system to discharge slurry and disposing the slurry, but shall be included in the bid price for “Micro-Milling Deck Surface”.

Division 600 - Electrical

[Include the following as necessary:]

Section 601 – Common Electrical Provisions

601.02 Materials

Remove the following:Junction Box Frames and Covers 918.17

Add the following:

Arc Flash Study 918.20(I)

Anti-Seize Compound 918.60

Precast Reinforced Concrete Junction Box 918.61

Wire Labels 918.65

Replace the last paragraph with the following:

Portland cement concrete in boxes, bases, manholes, and foundations shall be Class B, meeting the requirements of Section 401.

601.03 General Conditions

Add the following language to the beginning of the Section:

Existing electrical equipment, cabinets, or installations that are indicated on the Plans to be salvaged shall be transported to a location as directed by the Engineer. Request up-to-date contact information for the Electrical Foreman at the specified location and provide 24-hours’ notice.

1. Continuity of Illumination, Communication, and Power

Add the following to the end of the second paragraph:

Unless otherwise directed, the continuity of illumination is the sole responsibility of the Contractor.

1. Shop Drawings

Add the following to the list under Subsection E:

* Transformers
* Manual Transfer Switches
* Electrical Studies
* Flashing Beacons
* Aviation obstruction beacons
* Navigation lighting installations

1. Removal of Existing Electrical Facilities

Add the following to Item (1)

In all cases where transite conduit to be abandoned or is found abandoned, the Contractor shall install a #12 AWG solid THWN copper with thermoplastic insulation tracer wire in the length of the conduit for future location. Tracer wire shall be sealed at each end to prevent corrosion or damage. Abandoned conduit may require additional documentation (deed notice) to be filed by the Contractor, as required by the NJDEP Division of Solid and Hazardous Waste (DSHW). Consult the Management of Abandoned-in-place Asbestos Cement Pipe section of the Guidance Document for the Management of Asbestos-containing Material (ACM). All transite conduit to be removed shall be handled and transported in accordance with the NJDEP DSHW under the ACM, as well as Federal EPA guidelines.

Replace Item (5), Paragraph 2 with the following:

Unless otherwise indicated on the Plans, lighting standard assemblies shall be relocated complete with lighting standard shaft, bracket arm(s), transformer base or shoe base, luminaire(s), and parapet mounting brackets for bridge mounted units. New mounting hardware shall be provided.

The following Item is added:

(8) HPS and Mercury Vapor lamps removed from existing installations shall be handled in a manner that they do not break, and shall dispose of the lamps in accordance with the NJDEP by removing lamps from luminaires and turning them over to an acceptance facility in NJ or at one of the processing facilities in PA. Acceptance centers and processing facilities may be found on the NJDEP website, Division of Solid and Hazardous Waste, or by calling the Bureau of Landfill & Hazardous Waste Permitting.

1. Electrical Shut Down Procedures

Replace the entire Section (I) with the following:

Shutdown of Authority electrical power will be as directed and approved by the Engineer.

To arrange for a shutdown, the Contractor shall obtain approval from the Authority through the Engineer, to disconnect the electric service for the required circuits, prior to commencing with any work either directly related to or within the close proximity of the existing electrical facilities. The Contractor is responsible for “Tagging-Out” all circuits they will be working with and following all safety codes adopted by the Authority or other agencies having jurisdiction. At the end of the outage, the Contractor is to remove their tag and restore the circuit. The Authority will not remove a temporary tag placed by the Contractor. The Contractor will be responsible to restore service. In the case of lighting circuits, the circuit restoration shall be performed prior to darkness. In the case of other power circuits, the circuit restoration shall be performed at least one hour in advance of the scheduled end of shutdown.

Shutdowns are available Monday through Friday, excluding holidays from 9:00AM to 3:00PM with 24-hour advance notice to the Engineer. Arrangements between the Contractor, Engineer and Building Maintenance shall be coordinated to re-energize the shutdown circuits. All circuits should be re-energized in a timely manner such that they can be tested for proper operation prior to darkness. Shutdowns outside this time frame will be performed solely at the Authority’s discretion and shall be arranged on a case-by-case basis by the Contractor submitted for approval to the Engineer.

The roadway lighting systems at all work sites within the limits of this Contract, are of 2400V Class for series lighting circuits and 208V, 240V, 460V or 480V Class for the multiple circuits and therefore, all required electrical work must be performed in an approved manner, by licensed professionals and in accordance with the standard procedure for the class of voltage.

The Contractor shall furnish and install all temporary cables and ground wire, where required, to accommodate the removal and reinstallation of any existing 24-hour power circuits which shall be maintained as operational at all times.

601.04 Excavation and Backfill

Replace the third paragraph with the following:

The excavation for precast units shall be carefully made no larger than necessary. The bottom of excavation shall be thoroughly tamped, and the units shall bed evenly on the bottom of excavation. Precast units shall be placed at the same time as the conduit is laid. Fill adjacent to drains shall consist of not less than ten cubic feet of approved gravel or crushed stone.

601.05 Conduit

Delete the second to last paragraph and replace it with the following:

Conduits shall be maintained free of dirt or other foreign objectionable material. Ends of all conduits shall be closed with caps, plugs, or discs placed under the bushings until the cables and/or wires are installed or if conduit is designated to remain as spare/empty under final conditions.

Delete the last paragraph and replace it with the following:

All conduit installations below grade (in ground) or transitioning to/from below grade shall be sealed with corrosion resistant rodent blocking material and rodent deterrent foam after installation of all wires and cabling. Mesh shall be a minimum of 3 inches of length of conduit where installed. Foam shall fill a maximum of 3 inches of length of conduit where installed. See 918.46 and Standard Drawings.

Add the following language prior to Paragraph (A):

When conduits are found to be damaged, the Contractor shall inform the Engineer prior to performing any work. The Contractor shall remove the existing conduits and replace with new. The Contractor shall be responsible to dispose of the damaged conduits off Authority property.

1. Damage Credits

The last sentence is deleted and replaced with the following:

For all damages determined to be the fault of the Contractor, all costs for the prescribed conduit repairs and new cables and ground wire installation shall be borne by the Contractor at no additional cost to the Authority. For all damages determined to be an existing condition that is not the fault of the Contractor, all costs for the prescribed conduit repairs and new cables and ground wire installation shall be paid under the respective pay item bid.

1. Rigid Metallic Conduit

Replace the first two paragraphs with the following:

Rigid metallic conduits (hot-dipped galvanized steel and aluminum) shall be used in exposed above ground installations where the conduit is protected from the elements such as indoors, except where flexible and PVC coated galvanized conduits are called for, and as further prescribed hereinafter or on the Contract plans.

Galvanized steel conduit shall be used only where specifically directed in the plans for exposed conduit installation where the conduit is fastened to either steel structural members or concrete surfaces (pay item noted as “on structures”); unless otherwise noted where the conduit is encased in or embedded in concrete; for short underground runs where specifically called for on the Plans; and for the conduit installations by means of jacking operations.

Replace the twelfth paragraph with the following:

Conduits shall be fastened to structural members by means of conduit supports and U-bolts, as detailed on the Plans, spaced not more than five feet apart. Where possible, raceways and conduits installed on bridges or other structures shall be installed and secured via no-drill methods. No welding of conduit supports to structural steel members will be permitted. All drilling and modification to existing and proposed steel or concrete structures necessary to mount raceway systems shall be approved by the Engineer.

1. Duct Bank, HDPE Conduits – Directional Drilled
2. Directional Drilling Methods

Replace the entire Item (8) with the following:

Directional drilling shall conform to the following methods and submittal requirements pertaining to the installation of sleeves/conduits under existing embankments and paved roadways of the New Jersey Turnpike Authority:

1. The minimum allowable cover under roadways is 6 feet at the center of the roadway measured between the top of sleeves/conduits to top of pavement. Minimum cover under ditches is 3 feet measured from top of sleeve or conduit to invert of ditch. Pretreatment of soils or other soil stabilization techniques intended to reduce the minimum cover shall be approved by the Engineer.
2. Sending and receiving pits will not be allowed closer than 10 feet from the outer edge of the paved shoulder. Pits located between 10 to 30 feet from the outer edge of the paved shoulder shall be sheeted, braced, and shored in accordance to calculations and drawings provided by the Contractor. Sending and receiving pits located beyond 30 feet from the outer edge of paved shoulders may have un-sheeted sides provided a 1 to 1 slope can be maintained in accordance with the latest OSHA standards. In this case, the front face of the pit must be sheeted. In all cases, the pit shall be designed to maintain the stability of the embankment and to provide for proper operation of the drilling equipment. End sections of sleeves or pipes which are damaged during installation shall be replaced without additional compensation. Excavated material shall be placed on the side of the pit facing traffic to provide additional protection. Surplus and waste materials are to be disposed off Authority property in accordance with Section 206.
3. When pits are located between 10 and 30 feet from the outer edge of paved shoulder, a standard shoulder closing shall be required for the duration of the operation. In addition, a minimum of 30 feet of temporary concrete barrier is required in accordance with Turnpike standard drawings and in accordance with Division 800 of the Specifications. If the pit is constructed behind existing guard rail which meets current standards, temporary concrete barrier curb is not required. Pits located beyond 30 feet from the roadway require neither a shoulder closing nor temporary concrete barrier.
4. It is the Contractor’s responsibility to continually monitor the line and grade of the sleeve or pipe to detect abnormal horizontal and/or vertical movements. Necessary controls shall be provided to ensure proper horizontal and vertical alignment. The alignment shall be verified at any time at the request of the Engineer.
5. Entry or exit points shall not be installed in roadway medians unless shown on the Plans.
6. Detailed drilling operations and equipment shall be submitted to the Authority or their authorized representative for approval. Work is not to start before receipt of required approval.
7. All work areas must be enclosed with orange security fencing to maintain security and safety of the work site.
8. Strapping shall be stainless steel.
9. Show cross section along proposed bore within Authority ROW.
10. Detail means and methods to be used to ensure line and grade of pipe sleeve.
11. Once pipe sleeve is advanced from the point of entry and is within 10 feet of roadway edge of pavement all work shall be continuous until sleeve/conduit is advanced to at least 10 feet beyond the roadway far edge of pavement. Pipe sleeves are only required if noted on the plans.
12. During boring operations, roadway shall be monitored for settlement and /or heave along the line of bore.
13. Excavation and backfilling of the sending and receiving pits shall conform to Section 206.
14. In the event an obstruction or other condition prevents the completed installation, a concrete plug shall be installed at the end of the pipe or sleeve and the remaining void shall be filled in a manner approved by the Engineer. Removal or withdrawal of a drilled pipe, sleeve or casing will not be permitted.
15. Delays and/or inconvenience resulting from the presence of water or the pumping of water shall not be considered for additional compensation or extension of time but shall be considered incidental to the pipe or sleeve being installed.
16. All welding (for steel pipe sleeves) must be performed by a certified welder.
17. The work area shall be restored to its original condition upon completion of the installation subject to inspection and acceptance by the Authority. Care should be taken to protect adjacent trees and shrubs from injury during the progression of work.
18. Extend the sleeve at least 10 feet beyond the limits of roadway pavement.
19. Provide a method to seal the ends of the sleeve after installation of conduits within the sleeve. The method used shall provide a watertight seal. Provide shop drawings detailing the methods prior to commencement of any directional drilling operations.
20. The minimum allowable diameter for HDPE directionally drilled under the mainline is 4 inches and under ramp roadways is 3 inches.

601.06 Foundations, Boxes, Manholes and Bases

Replace the first paragraph with the following:

Concrete junction boxes (except Type D junction box), junction box foundations, manholes (except incoming electric and telephone service manholes, which may be of cast-in-place construction), and lighting standard bases (except those units to be constructed integrally with bridge parapet or median barrier) shall be precast monolithically. Junction box foundations and Type C junction boxes shall be constructed with Class B concrete. Manholes shall be constructed with 4500psi minimum air entrained concrete. Forms for cast-in-place junction boxes and manholes shall not be removed for twenty-four hours after the concrete is placed, and the box shall be kept moist for seven days after casting. Construction shall be in accordance with Section 401, using Class B concrete.

Replace the second paragraph with the following:

Ten (10) feet of crushed stone or gravel shall be placed under all in-ground junction boxes for drainage, including junction box foundations and manholes. Depth of crushed stone shall be a minimum depth of 12 inches.

Add the following language to the end of the tenth paragraph:

Precast junction box frame and cover shall be incidental to the pay item.

Add the following language to the end of this Subsection:

Composite junction boxes shall not be installed in paved surfaces.

All Type C, Type D, and Junction Box Foundation covers shall be bonded to the junction box frame via ultra-flexible tinned copper ground wire. The ultra-flexible ground wire shall be 6 gauge or larger.

Contractor shall perform grading as required if slopes are too steep (greater than 4:1) for installation of proposed foundation, boxes, manholes, and bases. Contractor shall inform Engineer and obtain approval of any installation that grading will be insufficient to mitigate future erosion or flooding under final conditions prior to performing any work.

Contractor shall clean all existing and proposed junction boxes to remain under final conditions within the project limits.

601.09 Testing

Add the following:

1. Inspection

The Contractor shall retain an independent licensed field inspector or licensed inspection service for inspection of all electrical installations the Contractor is responsible for. No separate payment will be made for inspection services retained by the Contractor.

1. Electrical Studies

The service disconnect and proposed panelboards are to be labeled with a warning label (detailed under 918.20) with the title “Arc Flash and Shock Risk Appropriate PPE Required” and including the following information: flash hazard at incident energy, flash protection boundary, site specific PPE, required PPE, shock hazard when cover is removed, limited approach distance, and restricted approach distance.  Label shall also include the Authority’s location ID, Interchange location, date prepared and designer.

The contractor shall prepare and submit for review electrical short circuit, protective device coordination, and arc flash studies. The studies shall be signed and sealed by a Professional Engineering licensed by the state of New Jersey using computer software by SKM Systems Analysis Power Suite, ETAP, or equal.

The studies shall be made in accordance with ANSI/IEEE C37.10 & C37.13, C57.96, C57.12.00, IEEE 141, 242, 399, 551, 1584, ICEA P-32-382, ICEA P-45-482, and conform to NFPA 70E, Electrical Safety in the Work Place. Studies shall be based on equipment installed in the field and device characteristics supplied by equipment manufacturers.

Contractor shall obtain all data in tabulated form required for completion of the studies. Comply with recommendations in IEEE 1584 and 551 and NFPA 70E for the amount of detail that is required to be acquired in the field. For new equipment, use characteristics submitted under the provisions of shop drawing submittals. For existing equipment, whether or not relocated, obtain required electrical distribution system data by field investigation and surveys.

Contractor shall coordinate with the utility to obtain utility available short circuit fault current and utility transformer primary over current protection to include in studies. Contractor shall call the utility main customer service number and reference the applicable meter number in all correspondence to obtain required information.

After the finalization and approval of report and studies, the contractor shall make modifications as recommended by the report approved by the Engineer. After modifications are complete, contractor shall apply arc flash hazard stickers to all equipment. See 918.20(I) for sample.

The extent of the electrical power system to be studied shall originate from the utility service and include all existing and proposed electrical loads connected to the power distribution system. Generators shall be included within the study if applicable.

1. Report

The report shall contain the following:

* Executive Summary
* Study Descriptions, Purpose, Basis, And Scope
* Qualification Data of Study Preparer and Checker
* Tabular Data of All Results
* One Line Diagram:

o Protective device designations and ampere ratings

o Cable size and lengths

o Transformer kilovolt ampere (kVA) and voltage ratings

o Motor and generator design and kVA ratings

o Switchgear, switchboard, motor-control center, and panelboard designations

* Short-Circuit Study:
  + Low-voltage fault report: three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
    - Voltage
    - Calculated fault-current magnitude and angle
    - Fault-point X/R ratio
    - Equivalent impedance

o Momentary Duty Report: Three-Phase and unbalanced fault calculations, showing the following for each overcurrent device location:

* + - Voltage
    - Calculated symmetrical fault-current magnitude and angle
    - Fault-point X/R ratio
    - Calculated asymmetrical fault currents:
      * Based on fault-point X/R ratio
      * Based on calculated symmetrical value multiplied by 1.6
      * Based on calculated symmetrical value multiplied by 2.7

o Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

* + - Voltage
    - Calculated symmetrical fault-current magnitude and angle
    - Fault-point X/R ratio
    - No AC decrement (NACD) ratio
    - Equivalent impedance
    - Multiplying factors for 2-, 3-, 5-, and 8-cycle breakers rated on a symmetrical basis
    - Multiplying factors for 2-,3-,5, and 8-cycle circuit breakers rated on a total basis
* Protective Device Coordination Study:
  + Recommended settings of protective devices, ready to be applied in the field. Includes manufacturer’s data sheets for recording the recommended setting of overcurrent protective

devices when available.

* + - Circuit Breakers:
      * Adjustable pickups and time delays (long time, short time, ground fault pick up)
      * Adjustable time-current characteristic
      * Adjustable instantaneous pick up
      * Recommendations on improved trip systems
    - Fuses:
      * Current rating, voltage, and class
  + Time-Current Coordination Curves: Settings of overcurrent protective devices to achieve selective coordination. TCC Curves shall graphically illustrate that adequate time separation exists between devices installed in series, including power utility company’s upstream devices. A separate set of curves shall be provided for switching schemes and for emergency periods where the power source is local generation. Include the following:
    - Device tag and title matching one-line diagram with legend identifying the portion of the system covered.
    - Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed
    - Identify the device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.
    - Plots with the listed characteristic curves, as applicable:
    - Power utility’s overcurrent protective device
    - Low-voltage equipment circuit-breaker trip devices, including manufacturer’s tolerance bands
    - Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves
    - Cable and conductors damage curves
    - Ground-fault protective devices
    - Generator short-circuit decrement curve and generator damage point
    - The largest feeder circuit breaker in each panelboard
    - Provide adequate time margins between device characteristics such that selective operation is achieved
* Arc-Flash Hazard Analysis:
  + Incident Energy and Flash Protection Boundary Calculations
  + Arcing fault magnitude
  + Protective device clearing time
  + Duration of arc
  + Arc-flash boundary
  + Working distance
  + Incident energy
  + Hazard risk category
  + Level of PPE required in standard industry calorie ratings
  + Areas where to prohibit work on energized equipment i.e., incident energy > 40 cal/cm2
  + Recommendations for arc-flash energy reduction
* Description of Results and Recommendations for System Improvements
* Sample Arc Flash Label
* Study Input Data
  + Contractor supplied tabulated data obtained in field and utility supplied data

Short-Circuit Study

Obtain all data necessary for conducting the study. Perform the short-circuit study following the general study procedures contained in IEEE 399. Calculate short-circuit currents according to IEEE 551. Study electrical distribution system from normal and alternate power sources throughout distribution system. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.

Include the AC fault-current decay from induction motors, synchronous motors, and asynchronous generators and shall apply to low-voltage, three-phase AC systems. The calculations shall also account for the fault-current DC decrement, to address the asymmetrical requirements of the interrupting equipment. For grounded systems, provide a bolted line-to-ground fault current study for areas as defined for the three-phase bolted fault short-circuit study.

Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault at each of the following:

* Electrical utility’s supply termination point
* Control Panels
* Standby Generators and Automatic Transfer Switches
* Panelboards
* Disconnect Switches

Protective Device Coordination Study

Obtain all data necessary for conducting the study. Perform the coordination study following the general study procedures contained in IEEE 399. Comply with IEEE 242 for determining coordination time intervals with the short-circuit currents calculated. Study electrical distribution system from normal and alternate power sources throughout distribution system. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.

For transformer primary overcurrent protective devices: device shall not operate in the response to inrush current when transformer is first energized, self-cooled, full-load current or forced-air-cooled, full-load current, and permissible transformer overloads according to IEEE C57.96 if required by unusual loading or emergency conditions. Device settings shall protect transformers according to IEEE C57.12.00, for fault currents.

For conductor protection: protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and protection recommendations in IEEE 242. Demonstrate that equipment withstands the maximum short-circuit current for a time equivalent to the tripping time of the primary relay protection or total clearing time of the fuse. To determine temperatures that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short-circuit current.

For generator protection: select protection according to manufacturer’s written recommendations and to IEEE 242.

The study performed shall be based on final conditions and include recommendations that can be implemented to improve coordination. The study shall be revised if directed by the Engineer.

Arc-Flash Hazard Analysis

Obtain all data necessary and from short-circuit and protective device coordination studies for conducting the Arc-Flash Hazard Analysis. Perform Arc-Flash Hazard Analysis per NFPA 70E and Annex D.

Calculate the maximum and minimum contributions of fault-current size. The minimum calculations shall assume that the utility contribution is at a minimum and shall assume no motor load. The maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.

Calculate the arc-flash protection boundary and incident energy at locations in the electrical distribution system where personnel could perform work on energized parts.

Include all low-voltage equipment locations.

Safe working distances shall be specified for calculated fault locations based on the calculated arc-flash boundary, considering incident energy of 1.2 cal/cm2.

Incident energy calculations shall consider the accumulation of energy over time when performing arc-flash calculations on buses with multiple sources. Iterative calculations shall take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors and generators shall be decremented as follows:

* Fault contribution from induction motors should not be considered beyond three to five cycles
* Fault contribution from synchronous motors and generators should be decayed to match the actual decrement of each as closely as possible

Arc-flash computation shall include both line and load side of a circuit breaker when the circuit breaker is in a separate enclosure and when the line terminals of the circuit breaker are separate from the work location.

Base arc-flash calculations on actual overcurrent protective device clearing time. Cap maximum clearing time at two seconds based on IEEE 1584, Section B.1.2.

601.11 Measurement

Add the following as the first paragraph:

Junction box, junction box foundation, and manhole frames and covers will not be measured separately, and the cost thereof shall be included in the individual pay item.

601.12 Payment

The following is removed from the list:

#\_\_\_ A.W.G. SERIES LIGHTING CABLE ........................................................................ LINEAR FOOT

Add the following to the list:

ELECTRICAL STUDIES LUMP SUM

The fifth paragraph is replaced with the following:

No separate payment will be made for Liquid-tight Flexible Metallic conduit installations. Such lengths of conduit shall be measured and paid under the items of the conduits to which they are connected.

Add the following language to the end of this Subsection:

No separate payment will be made for restoration of disturbed surfaces required to install junction boxes, conduit, or other underground facilities. All costs for the repair of such surfaces, including but not limited to concrete, berm surfacing, and slope protection shall be included in the bid price of the various conduit items installed.

No separate payment will be made for pavement restoration where conduit is installed using an open-trench method across existing roadways. All costs for the sawcutting, excavation, flowable fill, milling, pavement, concrete, rip rap, disposal of spoils, and other work shall be included in the bid price of the various conduit items installed using this method.

No separate payment will be made for conduit embedded within concrete bases and foundations for lighting standards, cabinets, and other electrical equipment. All costs for this conduit installation work, including required bonding and grounding, shall be distributed among the various base, platforms, and foundation pay items.

No separate payment will be made for couplings, condulets, fittings, or other devices required to provide a connected, bonded conduit system in accordance with the stated requirements.

Unless otherwise noted, junction and pull boxes that are sized 18 inches or smaller in the three ordinal dimensions will not be measured separately for payment. All costs for installation of these junction boxes, including mounting hardware, shall be distributed amongst the various conduit pay items bid.

No separate payment will be made for concrete encasement of conduits. All costs for the concrete encasement shall be included in the bid price of the conduit item.

No separate payment will be made for excavation of the conduit trench, filling the trench with CLSM to the bottom of the pavement structure, replacing the existing pavement structure in kind and restoring disturbed areas to original conditions.

No separate payment will be made for the coordination of conduit routing with existing/proposed utilities, drainage facilities, riprap, structures and/or other site-specific constraints. All costs for this work shall be included in the cost of its respective conduit pay item.

No separate payment will be made for the furnishing and installation of Rigid Non-Metallic conduit, spacers, concrete, excavation and backfill material shall include all labor, material and equipment necessary for the construction of duct banks as configured per plan, conduit support, termination at junction boxes, all as shown on Plans and as directed by the Engineer.

Payment for Duct Bank, HDPE Conduits Directional Drilled shall include excavating, dewatering, test pits, sheeting required for pits whether temporary or left in place, pipe sleeve, conduits and innerducts, disposal of soil materials, and all other incidental work necessary to return the site back to the existing condition. No separate payment will be made for the excavation, backfill, restoration of existing work area, and/or construction and restoration of the pits, or bentonite slurry mixture fill; the cost thereof shall be included in the cost of duct bank installation.

No separate payment will be made for installation of nylon pull cords, tracer wires, or locator wires. All costs for this work shall be included in the costs for the various conduit and duct bank pay items bid.

No separate payment will be made for wire labels or tags. Wire labels and tags shall be included under the appropriate wire and cable items.

No separate payment will be made for cable connector kits. Cable connector kits shall be included under the appropriate wire and cable items.

No separate payment will be made for the furnishing, installation, removal, or modification or any equipment necessary to maintain power distribution and communications to existing installations as required by these specifications.

No separate payment will be made for installation of foundations for load centers or power distribution equipment including concrete maintenance working platforms around power distribution equipment unless indicated otherwise. Contractor shall include all work and costs under the various power distribution equipment items bid.

No separate payment will be made for furnishing and installing structural steel and hardware.

No separate payment will be made to differentiate between the various differences regarding types of transformer foundations. Any differential is considered negligible and all costs thereof shall be included within the transformer foundation pay items bid.

No separate payment will be made for bollards installed around electrical equipment. All costs thereof shall be incidental to the various pay items bid.

The Contractor shall include all work for preparation of Reports, Short-Circuit Studies, Protection Device Coordination Study, Arc-Flash Hazard Analysis, and furnishing and installing labels under pay item “Electrical Studies”. No additional payment will be made for any field investigation or coordination effort to obtain information or data to determine this information.

Section 602 – Power Distribution

602.02 Materials

Add the following:

Surge Protective Devices 918.59

Manual Transfer Switch 918.20(J)

602.03 Power

1. Roadway, Toll Plaza and Service Area Lighting

Subparagraph 3 is deleted in its entirety.

1. Power Cables

Replace the second paragraph with the following:

All cable splicing for temporary and permanent facilities shall be made by means of new cable connector kits. All underground splices and splices that may be submerged shall be made by new resin-encapsulated splice kits. The Contractor shall only splice cables in pole bases, junction boxes, manholes, and designated electrical cabinets. The Contractor shall minimize the quantity of splices to the greatest extent as practical and may not be for The Contractor’s convenience. Installation of resin splice kits shall conform to the manufacturer’s installation instructions and as per the Authority’s standard drawings. All above-ground cable connector kits, upon completion of installation, shall be wrapped with several layers of half-lapped jacket tape to insure positive water and moisture-resistant connections.

In the third paragraph, remove the word “test” from the first sentence.

Replace the fourth paragraph with the following:

Cables and wires provided in total Contract quantities over 500 feet shall be 100% impregnated solid factory color coded. For cables with quantities of 500 linear feet or greater, the method of factory color coding must be accomplished. No deviation from factory color coding requirements regarding manufacturer or material specifications will be permitted.

For cable provided in total Contract quantities less than 500 feet, use of heat shrink wrap application may be accepted for all phase conductors. Heat shrink wrap application may be accepted for neutral or ground conductors sized #4 AWG and larger. For these installations if the contractor wishes to use heat shrink wrapping:

* The contractor shall provide a list of each area, including start and end points as well as total length of run indicating total quantity is less than 500’, for each section they are looking to use heat shrink wrapping. The designer will confirm or reject each run based upon review of this submission.
* Where approved, color heat shrink shall be accomplished such that all exposed conductors in all junction boxes shall be continuously identified by color within junction boxes, cabinets, etc. using heat shrink made from cross linked materials, flexible, flame retardant UV resistant, operating temperature of -67 degrees Fahrenheit to 275 degrees Fahrenheit, shrink temperature of 194 degrees Fahrenheit, flammability rating of Class 1 Self-extinguishing ASTM D2671 Procedure B Class 2 N/A, flued resistance per AMS-DTL-23053 1000 psi min tensile ASTM D638 400 V/mil min. ASTM D2671, and dielectric strength 500 V/MIL. (19.7 KV/mm) min. ASTM D2671. The color-coding heat shrink shall be installed for the entire length of cable from entry conduit to exit conduit, including all slack. The heat shrink shall be applied so as not to obliterate identification markings of the cable, as approved by the Engineer.

All cables and tabs shall be identified with wire tags with yellow background and 1 inch tall black lettering. Dedicated neutrals shall be labeled by circuit number, phase designation, and the letter ‘N’ e.g., “1AN” for circuit 1, phase A.

Replace the fifth paragraph with the following:

All cables in junction boxes, junction box foundations, cabinets, pull boxes, and at equipment terminal connections shall be tested for circuit connections, which shall be in conformity with those indicated on the Plans. After verification of circuit connections, these cables shall be provided with individual identification tags, as per Authority`s standard drawings, with circuit and phase designations, such as 1A, 1B, 1C, 1AN, 1BN, etc. for multiple lighting circuits. The tags shall be securely attached to the cables with nylon ties. All lighting standards shall be securely bolted in a vertical position to concrete bases, junction box foundations, or lighting blisters. They shall be plumbed with luminaires perpendicular to the centerline of the roadway by means of stainless steel shims between the transformer bases and concrete bases or junction box foundations or between the base plates and lighting blister.

Label all medium voltage circuits with the applicable voltage rating in every installation requiring access by maintenance including, but not limited to, junction boxes, manholes, and cabinets. Provide this tag in addition to the tag identifying other required cable identification.

Each lighting standard, whether new or relocated, shall be identified by means of aluminum identification plate(s), which shall bear the lighting standard and circuit numbers and phase designation for multiple circuits, the lighting standard number, utilized Voltage, lighting standard and luminaire types, all as shown on the Plans. A separate identification plate shall be provided for each luminaire supported by the lighting standard. Existing identification plates on relocated lighting standards shall be replaced, where required.

Add the following:

1. Luminaire Installations

Work shall include installation of the luminaire, wiring within the lighting standard, cable connector kits, Luminaire Headframe ring assembly, luminaire lowering device and fuses for all lighting systems.

Various types of luminaries, to be used on the Project, shall be as listed on Plans. Prior to installation of each luminaire, the Contractor shall check and verify the catalog number, wattage, Voltage, photometric distribution type, tilt, and aiming direction to produce the specified light distribution.

602.04 Power Distribution and Control Equipment

Add the following paragraph after the second paragraph:

All surge protective devices placed within existing or new load centers shall be as in the Specifications. No separate payment will be made for surge protective devices or the installation thereof.

Replace the eighth paragraph with the following:

Install Load Center Cabinets and Meter Cabinets at locations as shown on the Plans. The work shall consist of furnishing and installing the cabinets, appurtenances, mounting hardware, and all internal and attached external components as shown on the Plans including but not limited to circuit breakers, meter pans, contactors, transformers, panelboards, photocells, thermostats, heaters, receptacles, and surge protective devices. Furnish and install wiring between devices within the cabinet and terminate all wiring to field devices. Perform grounding work as required by the National Electrical Code. For Meter Cabinets, coordinate with local utility to ensure that details used comply with local requirements. Perform all coordination and work, and obtain inspections necessary to provide a complete, connected power service, including any temporary work necessary to keep existing electrical systems operational.

Add the following language to the end of this Subsection:

Install bollards at locations shown on the Plans. Provide bollards with yellow sleeve covers.

Install transformers at locations as shown on the Plans. The work shall consist of furnishing and installing of all primary and secondary connections, dual power sources interlocking, if required, incoming service and outgoing conductors, primary as well as secondary protection, safety locks and identification tags, grounding, bonding, conduit fittings, protective enclosure, concrete foundation and all other mounting hardware. Perform all internal as well as external inspections and tests during and after installation with good workmanship and attention to details. The work shall comply with all safety and NEC requirements.

Install manual transfer switches at locations as shown on the Plans and deliver compatible female cam-style plugs to the Authority. Prior to installation of manual transfer switches, Contractor shall examine the areas and conditions under which the manual transfer switch is to be installed and notify the Engineer in writing if unsatisfactory conditions exist. Manual transfer switch shall be installed as shown on the drawings and per the manufacturer’s written instructions. In addition, the installation shall meet the requirements of local codes, the National Electrical Code and National Electrical Contractors Association’s “Standard of Installation”. Conduit entry into the manual transfer switch shall be by Contractor; Contractor shall furnish and install listed watertight conduit hubs, as manufactured by MYERS or T&B or approved equal, for each conduit entry on the manual transfer switch. The incoming hub size shall match the conduit size for feeders and ground as shown on the drawings. The outgoing hub size shall match the conduit size for loads and ground as shown on the drawings. Hubs shall be properly installed and tightened to maintain Type 3R integrity of the manual transfer switch enclosure. Contractor shall terminate feeder conductors, load conductors and ground per the manufacturer’s instructions. All field wiring terminations shall be torqued as required per the instructions on the manual transfer switch’s power distribution block, circuit breaker & ground lug. Perform the following field tests for each manual transfer switch:

1. Field Tests for Manual Transfer Switches

Prior to energizing manual transfer switch, the Contractor shall perform the following checks and tests as a minimum:

1. Verify mounting and connections are complete and secure.
2. Verify internal components and wiring are secure.
3. Perform continuity check of all circuits.
4. Perform 1,000 VDC megger test on feeder, load and ground cables.
5. Verify deadfront is secure.
6. With the manual transfer switch deadfront in place and the main access door closed and properly latched, actuate both Operator Mechanisms; verify only (1) breaker at a time can be turned to the “ON” position.
7. Confirm operation of the manual transfer switch ground receptacle by attaching a plug to the manual transfer switch ground receptacle and then verify that the plug is grounded to the facility ground.

Install power distribution cabinets and perform modifications to power distribution cabinets at location shown on the Plans. The work shall consist of furnishing and installing the cabinets, appurtenances, mounting hardware, and all internal and attached external components as shown on the Plans including, but not limited to, panelboards, circuit breakers, and wiring between equipment. Perform grounding as required by the National Electrical Code. Perform applicable removal and installation of all equipment as shown on the Plans.

602.05 Measurement

Add the following:

Transformers will be measured by the number installed.

Electrical Studies will be measured on a lump sum basis.

Disconnect Switches will be measured by the number installed.

Manual Transfer Switches will be measured by the number installed.

Power Distribution Cabinets will be measured by the number installed.

602.06 Payment

Add the following:

Payment will be made under:

PAY ITEM PAY UNIT

Manual Transfer Switch Each

Transformer, Type \_\_\_ KVA; Voltage \_\_\_V - \_\_\_V Each

Power Distribution Cabinet Each

Power Distribution Cabinet, Modification Each

No separate payment will be made to differentiate between the various differences regarding equipment being installed within power distribution cabinets or work required to be performed under power distribution equipment modifications. Any differential is considered negligible, and all costs thereof shall be included within the “power distribution cabinet” and “power distribution equipment, modification” pay items bid.

Section 603 – Lighting

603.02 Materials

Add the following:

Vibration Damping Pads 918.63

Navigation Lights, Solar 918.64

603.03 Installations

1. Lighting Standard Installations

Add the following language after the first paragraph:

All shoe base lighting standards installed on elevated structures shall be furnished and installed with a vibration damping pad. The damping pads shall be fabricated to the dimensions found on the Standard Drawings.

1. Luminaire Installations

Add the following language after the first paragraph:

Luminaire must be installed in exact location shown on the Plans to minimize the light pollution on residential properties. Furnish and install lighting standards with the exact model number shown on the Plans including luminaires indicated to be provided with factory installed House Side Shield if required on the Plans.

1. Sign Lighting

Add the following:

The existing sign lighting systems being removed and replaced with an LED sign lighting system shall be removed in accordance to Section 601.03(G).

Add the following:

1. Temporary Lighting Systems

Perform all work necessary to maintain illumination of roadway lighting system for the duration of the project construction in accordance with the requirements of the Plans and Specifications.

A temporary lighting scheme and electrical system staging concept is shown on the Plans. The Contractor shall follow this scheme unless otherwise required due to changes in overall project staging. Any deviations to the temporary lighting design shown shall be designed in accordance with the requirements shown on the Plans. The Contractor shall submit signed and sealed designs for temporary lighting, including photometric calculations, to the Engineer for approval. The Authority reserves the right to modify or request revisions to proposed temporary lighting schemes.

This work shall include, but not be limited to, the following:

* Submitting shop drawings
* All temporary lighting and power distribution work for the various construction stages and removal of all temporary equipment at the end of the project.
* Installation of temporary light poles and luminaires
* Modification to existing light poles
* Removal, installation, and relocation of luminaires
* Temporary modifications to proposed light poles
* Temporary power distribution systems, including conduits, boxes, and cables
* Temporary or permanent modifications to existing load/proposed centers, and power distribution equipment
* Temporary electric services or other power sources, if needed
* Field measurement and engineering design work necessary to develop structural mounting details and power distribution designs
* Storage and transportation required for the temporary lighting systems
* Work necessary to return electrical systems to remain to their pre-existing condition at the completion of the project

The Contractor will be allowed to use exposed cables for temporary power distribution installations under 600 Volts. Exposed cable shall be rated for continuous outdoor exposure and shall have a UV-resistant insulation and jacket. Aerial installations will be allowed, with prior Engineer approval, if public safety can be ensured. Aerial cable installations will not be permitted to cross the roadway between lighting standards.

Temporary power distribution serving circuits over 600 Volts shall be continuously enclosed in Schedule 40 PVC or Rigid Metallic Conduit. All splices shall be made within junction boxes.

Temporary junction boxes shall be permitted to be fiberglass, PVC, steel, or other material suitable for continuous outdoor use, and shall be rated for wet environments.

Temporary cables shall be the Section 601.07(A).

Where temporary conductors are subject to damage by vehicular impact or construction activity, or may be readily accessed by unauthorized individuals, cables shall be enclosed within Schedule 40 PVC Conduit. Where installed along bridge parapets, the cables shall be suspended outside the parapet alongside of the bridge within Schedule 40 PVC conduits.

Temporary lighting installations shall meet all applicable OSHA regulations. It shall be the sole responsibility of the Contractor to meet said regulations.

Contractor will be responsible for obtaining all required approvals in a timely manner.

The Contractor may use the existing above-ground highway lighting material designated for removal for the temporary highway lighting system that is not required.

603.04 Measurement

Add the following language to the end of this Subsection:

Relocate Light Pole and Luminaire shall be measured by each set, which will include internal work, exposed work, and all connections to construct a fully installed, connected and operational installation. Perform all work necessary to maintain illumination of roadway lighting system for the duration of the project construction.

Temporary Lighting Systems shall be measured on a lump sum basis.

603.05 Payment

Add the following to the pay item table:

Payment will be made under:

PAY ITEM PAY UNIT

Relocate Light Pole and Luminaire Each

Lighting Standard, Type L-ITS-40 Each

Temporary Lighting Systems Lump Sum

Illumination For Sign Structure Location No. \_\_\_ Lump Sum

Add the following at the end of this Subsection:

No separate payment will be made for furnishing and installing luminaires with house side shields. All costs thereof will be incidental to the luminaire pay item.

No additional payment will be made for any work arising from changes to the Temporary Lighting design shown on the Plans.

No separate payment will be made for miscellaneous work required to connect power to proposed lighting standards including, but not limited to, mounting hardware, welding, expansion couplings, and/or conduit reducers.

No separate payment will be made for cables from the luminaire to the nearest adjacent junction box. Contractor shall include all costs to within the various applicable lighting standard, luminaire, and lighting relocation pay items.

No separate payment will be made for miscellaneous work required to connect power to proposed lighting standards including, but not limited to, mounting hardware, welding, expansion couplings, non-destructive proof load testing, and/or conduit reducers.

Section 605 – Intelligent Transportation Systems

605.01 Description

1. Definitions

Add the following language to the end of this paragraph:

|  |  |
| --- | --- |
| Fixed Panel Sign Variable Insert (FPSVI) | An application of a Variable Message Sign that adds variable content to a fixed-panel sign and is attached to the fixed-panel sign. |

Add the following Paragraph:

1. Fixed Panel Sign Variable Insert (FPSVI)

The work shall consist of furnishing and installing FPSVIs complete with controllers, mounting hardware, fixed-panel sign cutouts, power transformers, power and communications cabling, surge protectors, communications equipment and other items and appurtenances required to provide working systems.

The work shall also include installing and connecting System Control Cabinets (SCCs), furnishing and installing of power and communications wiring serving the FPSVI, and performing partial and final acceptance testing of the FPSVIs and their controllers after installation.

605.03 Methods of Construction

Add the following Paragraph:

1. Fixed Panel Sign Variable Insert (FPSVI)

The work shall consist of performing all necessary work to furnish, install, and prepare the Variable Message Sign for integration and testing.

Furnish and install conduits and perform work as shown on the Plans to provide continuous communications and power raceway paths between the SCC and the VMS. Pull and terminate power and communications cables between the SCC and the VMS as shown on the plans.

Install structural supports as shown on the plans to position the VMS in the appropriate location in the fixed-panel sign. Recess the VMS such that the front of the VMS extends no more than one inch from the face of the fixed-panel sign. Verify actual dimensions of VMS prior to cutting into fixed panel sign.

Power cable type, size, and quantity of conductors shall be furnished and installed as shown on the Plans.

Ensure that no manufacturer or Contractor text or graphics appears on the VMS face other than as shown on the contract plans.

Add the following Section:

Section 606 - Traffic Signals

606.01 Description

This work shall consist of furnishing and installing completely wired traffic signal systems.

A complete traffic signal installation is generally composed of two systems, one underground and the other above ground.

The underground installation consists of conduits, junction boxes and foundations for standards, pedestals, push button stations, meter cabinets, traffic signal controllers, and the installation of detectors.

The above-ground installation consists of meter cabinets, traffic signal controllers, signal standards, mast arms, pedestals, signal heads, lamps, LED traffic signal modules, pedestrian push button assemblies, wire and wiring, bonding and grounding, connection to utility service, and testing.

Terms used are according to NEMA Standard Publication No. TS‑1, Section 1, entitled Traffic Control Systems.

606.02 Materials and Equipment

Materials and equipment shall conform to [Section 601](#s701) and to the following Subsections:

Traffic Signal Lamps 918.13

Loop Detector Lead 918.25

|  |  |
| --- | --- |
| Table 606-1 Electrical Material Specifications | |
| Material | Specification |
| Joint Sealant | EB‑JS‑1 |
| Loop Detector Card | EB-LD-CARD |
| Optically Programmed Traffic Signal Head | EB‑TS‑2 |
| Pedestrian Signal Head | EB‑PS‑1 |
| Push Button Assembly | EB‑PPB‑1 |
| Traffic Signal Head | EB‑TS‑1 |
| Traffic Signal Controller, Eight-Phase | EB‑TSC‑ITB‑8 |
| Fiber-optic Two Color Turn Arrow | EB-TS-3 |
| Optically Controlled Emergency Vehicle Detection System | EB-EOVD |
| Test Controller Unit for Two to Eight-Phase Solid State NEMA Type Traffic Signal Controllers | EB-TSC-CTU |
| Optically Programmed Adjustable Face Pedestrian Signal Heads | EB-PS-4 |
| Fiber-optic Blank-out Sign | EB-FOBS |
| Red LED Traffic Signal Module | EB-REDLED-TSM |
| Green LED Traffic Signal Module | EB-GRNLED-TSM |
| Green, Amber, and Red LED Turn Arrow Module | EB-LED-GARTAM |
| LED Bi-modal Turn Arrow Module | EB-LED-BTAM |
| Traffic Signal Head | EB-TS-1A |

Loop Wire 918.26

Cabinets 918.27

Panel Boards and Circuit Breakers 918.28

Pedestals, Poles, Transformer Bases, and Mast Bracket Arms 918.29

Traffic Signal Cable 918.30

The following materials and equipment shall conform to the New Jersey Electrical Materials Specifications listed below:

Other materials and equipment shall conform to the following:

1. Controller Assembly

Each actuated controller shall be furnished and installed with the following equipment which shall be connected to the back panel of the controller cabinet:

* Single circuit solid state flasher.
* Loop detector card. A maximum of one loop shall be connected to a sensor channel unless otherwise indicated on the plans. A minimum of eight loop detector cards shall be provided.

All equipment required to perform the required signal operation shall be furnished and installed. The controller shall be completely wired to the terminal blocks in the meter cabinet.

1. Meter Cabinets

Meter cabinets shall consist of cabinets, meters, control and distribution facilities, the grounding of all equipment, internal wire and wiring to component parts, photoelectric control unit and wire, and wiring to the same. The metering facilities shall conform to all utility company requirements.

1. Pedestal Assemblies

Pedestal assemblies shall consist of furnishing and installing a pedestal pole with base and slip-fitter cap, miscellaneous fittings and hardware, traffic or pedestrian signal heads or both and traffic signal cable from the terminal block of each face to the base of the standard.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Table 606-2 Pedestal Assemblies (Height 8 Feet) | | | | |
| Type | No. of Std. Faces | No. of Ped. Faces | No. of Prog. Faces | No. of Spider Assemblies |
| P-1 | 1 | 0 | 0 | 0 |
| P-2 | 2 | 0 | 0 | 1 |
| P-3 | 3 | 0 | 0 | 1 |
| P-4 | 4 | 0 | 0 | 1 |
| P-1-W-1 | 1 | 1 | 0 | 1 |
| P-2-W-1 | 2 | 1 | 0 | 1 |
| P-3-W-1 | 3 | 1 | 0 | 1 |
| P-1-W-2 | 1 | 2 | 0 | 1 |
| P-2-W-2 | 2 | 2 | 0 | 1 |
| PW-1 | 0 | 1 | 0 | 0 |
| PW-2 | 0 | 2 | 0 | 1 |
| PW-3 | 0 | 3 | 0 | 1 |
| P-1-OP | 0 | 0 | 1 | 0 |
| P-2-OP | 0 | 0 | 2 | 1 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Table 606-3 Pedestal Assemblies (Height More Than 8 Feet) | | | | |
| Type | No. of Std. Faces | No. of Ped. Faces | No. of Prog. Faces | No. of Spider Assemblies |
| P-1-D | 1 | 0 | 0 | 0 |
| P-2-D | 2 | 0 | 0 | 1 |
| P-3-D | 3 | 0 | 0 | 1 |
| P-4-D | 4 | 0 | 0 | 1 |
| P-1-W-1-D | 1 | 1 | 0 | 1 |
| P-1-W-2-D | 1 | 2 | 0 | 1 |

Pedestal assemblies designated with the letter “D” shall be furnished according to the height as shown on the Plans.

Use “J” assemblies when replacing signals on pedestal poles:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Table 606-4 “J” Assemblies | | | | |
| Type | No. of Std. Faces | No. of Ped. Faces | No. of Prog. Faces | No. of Spider Assemblies |
| J-1 | 1 | 0 | 0 | 0 |
| J-2 | 2 | 0 | 0 | 1 |
| J-3 | 3 | 0 | 0 | 1 |
| J-4 | 4 | 0 | 0 | 1 |
| J-1-W | 0 | 1 | 0 | 0 |
| J-2-W | 0 | 2 | 0 | 1 |
| J-1-W-1 | 1 | 1 | 0 | 1 |
| J-1-W-2 | 1 | 2 | 0 | 1 |
| J-2-W-2 | 2 | 2 | 0 | 1 |

Pedestal assemblies designated with the letter “J” shall consist of furnishing and installing a traffic signal head on an existing traffic signal pedestal. The item shall include a slip-fitter, miscellaneous fittings, No. 14 traffic signal cable from the terminal block of the head to the base of the standard, and removal of an existing signal head.

1. Pedestrian Signal Assemblies

Pedestrian signal assemblies shall be of the following types:

* Type W‑1 shall consist of furnishing and installing one pedestrian signal head with pole clamp mounting, miscellaneous fittings, the drilling of the standard, installing the grommet and traffic signal cable from the terminal block of the face to the base of the standard.
* Type W‑1‑OP shall consist of furnishing and installing one optically programmed pedestrian signal head with pole clamp mounting, miscellaneous fittings, the drilling of the standard, installing the grommet and traffic signal cable from the terminal block of the face to the base of the standard.

1. Push Button Assemblies

Push button assemblies shall include the complete push button and housing, traffic signal cable from terminals of the push button to the base of the standard, and instruction sign. The signs shall be in conformance with the MUTCD. The legend for the sign shall be Push Button for Green Light except if WALK ‑ DON’T WALK indications are used, the legend shall be Push Button for WALK Signal. Push buttons shall operate on logic ground.

1. Push Button Standard

Push button standard shall consist of a traffic signal pedestal complete with all mounting hardware and raintight pole cap.

1. Traffic Signal Cable

Traffic signal cable shall be multi‑conductor cable conforming to Subsection 918.30 and shall consist of furnishing and installing the cable, all required splicing, cable tags, and providing slack cable in the standards, pedestals, meter cabinets and controller cabinets.

1. Traffic Signal Assemblies

Traffic signal assemblies shall consist of traffic signal arm, furnished and installed on a traffic signal standard complete with mast arm hanger and spider assemblies, or mounting bracket assembly, as required, safety chains, traffic signal heads, miscellaneous hardware and fittings, and traffic signal cable from the terminal block of each face to the base of the traffic signal standard. The red, green, bi-module turn arrow, and green, amber, and red turn-arrow LED modules shall be used for all related indications.

Free swinging traffic signal heads mounted at the end of a mast arm shall be aluminum.

Traffic signal assemblies designated with the letters “MA” shall consist of assemblies having a traffic signal arm of the aluminum mast arm type.

Traffic signal assemblies designated with the letters “MK” shall consist of assemblies having a traffic signal arm of the aluminum mast arm type that shall fit a 9-inch, outside diameter, pole top.

Traffic signal assemblies designated with the letters “TA” shall be assemblies having a traffic signal arm of the aluminum trombone type. A mast arm hanger and safety chains are not required.

Traffic signal assemblies designated with the letter “S” shall be assemblies having a traffic signal arm of the steel type. Signal mounting bracket assemblies shall be furnished with all steel mast arms.

Traffic signal assembly Type C‑1 shall consist of one traffic signal head with pole clamp mounting furnished and installed on a traffic signal standard. The item shall also include miscellaneous fittings, the drilling of the standard, installing the grommet, and traffic signal cable from the terminal block of each face to the base of the standard.

Traffic signal assembly Type C‑1‑OP shall consist of one optically programmed traffic signal head with pole clamp mounting furnished and installed. The item shall also include miscellaneous fittings, the drilling of the standard, installing the required grommet, and traffic signal cable from the terminal block of each face to the base of the standard.

Traffic signal assembly Type MM‑1 shall consist of a midmounted traffic signal head furnished and installed on a mast arm, complete mounting hardware, drilling the arm, grommet, midmount bracket assembly, safety chain, one traffic signal head, and traffic signal cable from the terminal block of each face to the base of the traffic signal standard.

Traffic signal assembly Type MM‑1‑OP shall consist of an optically programmed traffic signal head furnished and installed on a mast arm, complete mounting hardware, drilling the arm, grommet, midmount bracket assembly, safety chain, one optically programmed traffic signal head, and traffic signal cable from the terminal block of the face to the base of the traffic signal standard.

| Table 606-5 Traffic Signal Assemblies | | | | |
| --- | --- | --- | --- | --- |
| Type | Nominal Arm Length (Feet) | No. of Std. Faces | No. of Spider Assemblies | No. of Prog. Faces |
| 15MA-1 | 15 | 1 | 0 | 0 |
| 15MA-2 | 15 | 2 | 1 | 0 |
| 15MA-3 | 15 | 3 | 1 | 0 |
| 15MA-4 | 15 | 4 | 1 | 0 |
| 20MA-1 | 20 | 1 | 0 | 0 |
| 20MA-2 | 20 | 2 | 1 | 0 |
| 20MA-3 | 20 | 3 | 1 | 0 |
| 20MA-4 | 20 | 4 | 1 | 0 |
| 25MA-1 | 25 | 1 | 0 | 0 |
| 25MA-2 | 25 | 2 | 1 | 0 |
| 25MA-3 | 25 | 3 | 1 | 0 |
| 25MA-4 | 25 | 4 | 1 | 0 |
| 30S-1 | 30 | 1 | 0 | 0 |
| 30S-2 | 30 | 2 | 0 | 0 |
| 35S-1 | 35 | 1 | 0 | 0 |
| 35S-2 | 35 | 2 | 0 | 0 |
| 40S-1 | 40 | 1 | 0 | 0 |
| 40S-2 | 40 | 2 | 0 | 0 |
| 45S-1 | 45 | 1 | 0 | 0 |
| 45S-2 | 45 | 2 | 0 | 0 |
| 50S-1 | 50 | 1 | 0 | 0 |
| 50S-2 | 50 | 2 | 0 | 0 |
| 55S-1 | 55 | 1 | 0 | 0 |
| 55S-2 | 55 | 2 | 0 | 0 |
| 60S-1 | 60 | 1 | 0 | 0 |
| 60S-2 | 60 | 2 | 0 | 0 |
| 65S-1 | 65 | 1 | 0 | 0 |
| 65S-2 | 65 | 2 | 0 | 0 |
| 15MA-1-OP | 15 | 0 | 0 | 1 |
| 15MA-2-OP | 15 | 0 | 1 | 2 |
| 15MA-1-1-OP | 15 | 1 | 1 | 1 |
| 20MA-1-OP | 20 | 0 | 0 | 1 |
| 20MA-2-OP | 20 | 0 | 1 | 2 |
| 20MA-1-1-OP | 20 | 1 | 1 | 1 |
| 25MA-1-OP | 25 | 0 | 0 | 1 |
| 25MA-2-OP | 25 | 0 | 1 | 2 |
| 25MA-1-1-OP | 25 | 1 | 1 | 1 |
| 20MK-1 | 20 | 1 | 0 | 0 |
| 20MK-2 | 20 | 2 | 1 | 0 |
| 20MK-3 | 20 | 3 | 1 | 0 |
| 20MK-4 | 20 | 4 | 1 | 0 |
| 25MK-1 | 25 | 1 | 0 | 0 |
| 25MK-2 | 25 | 2 | 1 | 0 |
| 25MK-3 | 25 | 3 | 1 | 0 |
| 25MK-4 | 25 | 4 | 1 | 0 |
| 30S-1-OP | 30 | 0 | 0 | 1 |
| 30S-2-OP | 30 | 0 | 0 | 2 |
| 30S-1-1-OP | 30 | 1 | 0 | 1 |
| 35S-1-OP | 35 | 0 | 0 | 1 |
| 35S-2-OP | 35 | 0 | 0 | 2 |
| 35S-1-1-OP | 35 | 1 | 0 | 1 |
| 40S-1-OP | 40 | 0 | 0 | 1 |
| 40S-2-OP | 40 | 0 | 0 | 2 |
| 40S-1-1-OP | 40 | 1 | 0 | 1 |
| 45S-1-OP | 45 | 0 | 0 | 1 |
| 45S-2-OP | 45 | 0 | 0 | 2 |
| 45S-1-1-OP | 45 | 1 | 0 | 1 |
| 15TA-1 | 15 | 1 | 0 | 0 |
| 15TA-2 | 15 | 2 | 0 | 0 |
| 15TA-3 | 15 | 3 | 0 | 0 |
| 15TA-4 | 15 | 4 | 0 | 0 |
| 20TA-1 | 20 | 1 | 0 | 0 |
| 20TA-2 | 20 | 2 | 0 | 0 |
| 20TA-3 | 20 | 3 | 0 | 0 |
| 20TA-4 | 20 | 4 | 0 | 0 |
| 25TA-1 | 25 | 1 | 0 | 0 |
| 25TA-2 | 25 | 2 | 0 | 0 |
| 25TA-3 | 25 | 3 | 0 | 0 |
| 25TA-4 | 25 | 4 | 0 | 0 |
| 15TA-1-OP | 15 | 0 | 0 | 1 |
| 15TA-2-OP | 15 | 0 | 0 | 2 |
| 15TA-1-1-OP | 15 | 1 | 0 | 1 |
| 15TA-2-1-OP | 15 | 2 | 0 | 1 |
| 15TA-3-1-OP | 15 | 3 | 0 | 1 |
| 15TA-1-2-OP | 15 | 1 | 0 | 2 |
| 15TA-2-2-OP | 15 | 2 | 0 | 2 |
| 15TA-1-3-OP | 15 | 1 | 0 | 3 |
| 20TA-1-OP | 20 | 0 | 0 | 1 |
| 20TA-2-OP | 20 | 0 | 0 | 2 |
| 20TA-1-1-OP | 20 | 1 | 0 | 1 |
| 20TA-2-1-OP | 20 | 2 | 0 | 1 |
| 20TA-3-1-OP | 20 | 3 | 0 | 1 |
| 20TA-1-2-OP | 20 | 1 | 0 | 2 |
| 20TA-2-2-OP | 20 | 2 | 0 | 2 |
| 20TA-1-3-OP | 20 | 1 | 0 | 3 |
| 25TA-1-OP | 25 | 0 | 0 | 1 |
| 25TA-2-OP | 25 | 0 | 0 | 2 |
| 25TA-1-1-OP | 25 | 1 | 0 | 1 |
| 25TA-2-1-OP | 25 | 2 | 0 | 1 |
| 25TA-3-1-OP | 25 | 3 | 0 | 1 |
| 25TA-1-2-OP | 25 | 1 | 0 | 2 |
| 25TA-2-2-OP | 25 | 2 | 0 | 2 |
| 25TA-1-3-OP | 25 | 1 | 0 | 3 |

Use “H,” “HC,” and “HM” assemblies according to the following table when replacing signals on traffic signal mast arms and standards:

| Table 606-6 Replacement Traffic Signal Assemblies | | | | |
| --- | --- | --- | --- | --- |
| Type | Nominal Arm Length (Feet) | No. of Std. Faces | No. of Spider Assemblies | No. of Prog. Faces |
| H-1 | NA | 1 | 0 | 0 |
| H-2 | NA | 2 | 1 | 0 |
| H-3 | NA | 3 | 1 | 0 |
| H-4 | NA | 4 | 1 | 0 |
| H-1-OP | NA | 0 | 0 | 1 |
| HC-1 | NA | 1 | 0 | 0 |
| HC-2 | NA | 2 | 0 | 0 |
| HC-3 | NA | 3 | 0 | 0 |
| HC-1-OP | NA | 0 | 0 | 1 |
| HM-1 | NA | 1 | 0 | 0 |
| HM-2 | NA | 2 | 0 | 0 |
| HM-3 | NA | 3 | 0 | 0 |
| HM-4 | NA | 4 | 0 | 0 |
| HM-1-OP | NA | 0 | 0 | 1 |

Traffic signal assemblies designated with the letter “H” shall consist of furnishing and installing a traffic signal head on an existing traffic signal mast arm. The item shall include a mast arm hanger or mounting brackets, safety chain, miscellaneous fittings, No. 14 traffic signal cable from the terminal block of the signal head to the base of the standard, and removal of the existing traffic signal head assembly.

Traffic signal assemblies designated with the letters “HC” shall consist of furnishing and installing a traffic signal head on an existing traffic signal standard. The item shall include pole clamps, miscellaneous fittings, the drilling of the traffic signal standard if required, installing the grommet, No. 14 traffic signal cable from the terminal block of each face to the base of the standard, and removal of the existing traffic signal head assembly.

Traffic signal assemblies designated with the letters “HM” shall consist of furnishing and installing a mid-mounted traffic signal head on an existing traffic signal mast arm. The item shall include complete mounting hardware, drilling of the mast arm if required, installing the grommet, mid-mount bracket assembly, safety chain, No. 14 traffic signal cable from the terminal block of each face to the base of the standard, and removal of the existing traffic signal head assembly.

Traffic signal assemblies shall also consist of removing the lamp, lens, and reflector and furnishing and completely installing an LED module in all traffic signal heads, except the amber bulbs, and optically programmed signals.

Signs mounted on traffic signal mast arms shall utilize vertical mounted type, high-strength aluminum alloy, swing sign brackets with stainless steel components; heavy duty stainless steel straps adaptable to any pole diameter; and removable stainless steel damper springs. Swing sign brackets shall be adjustable for leveling.

1. Traffic Signal Standards

Aluminum traffic signal standards shall be installed complete with a separate bolt‑on transformer base of one of the following types:

* An 8-inch Type TB‑30 base with through bolts shall be furnished with all traffic signal standards mounted on 11-inch bolt circles.
* A 20-inch Type TB‑20 base shall be furnished with all traffic signal standards mounted on 15-inch bolt circles.
* A 24-inch Type TB‑K base shall be furnished with all traffic signal standards mounted on 22-inch bolt circles.

A separate transformer base is not required for steel traffic signal standards.

Ground studs shall be furnished and installed in all transformer bases or in the standard. Ground wire shall be installed and shall extend to the ground rod.

Traffic signal standards, Type KE, shall be mounted on a new or existing K-pole. Traffic signal standards, Type S, shall be a pole of the steel type. Traffic signal standards, Type SC shall consist of a modified steel traffic signal pole that shall have the capability of accommodating a 15 or 20 foot long lighting arm.

1. Loop Detector

Loop detector shall consist of cutting a loop trench, cleaning the loop trench, furnishing and installing the wire within the loop trench and, from the termination of the loop trench to the nearest junction box, splicing of wire to the loop detector leads, testing, drilling and repairing the curb, and furnishing and installing the sealant. The wire shall be loop wire as specified in Subsection 918.26.

1. Loop Detector Lead

Loop detector lead shall consist of furnishing and installing of wire specified in Subsection 918.25, connection of the wire to the terminals of the loop detector panel and splicing of the wire to the loop detector.

1. Traffic Controller Assembly Turn On

Traffic controller assembly turn on shall consist of supplying a technician, representing the controller manufacturer, at the site when each controller assembly is placed into operation and upon assumption of maintenance by the Department.

606.03 Construction Requirements

The provisions of Section 601 shall apply.

When modifications are made to an existing traffic signal system, as‑built prints shall be updated and maintained. The as‑built prints shall be stored in the controller cabinet for each system for use by Department maintenance personnel.

Traffic signal standards shall be securely bolted to the foundations and shall be erected with sufficient rake as to assume a vertical position after all attachments and appurtenances are in place. Shims shall be installed to a maximum of ¼ inch.

Mounting fittings shall provide the proper clearance to aim and adjust the traffic control device. Fittings and mounting hardware not shown on the Plans shall conform to the recommendations of the manufacturer.

Factory installed wrapping shall remain on the poles and bracket arms for as long as recommended by the manufacturer. Every effort shall be made to install the standards and arms with the wrapping in place and every precaution shall be taken to maintain the standard and other equipment in their original factory appearance. In all cases, the ropes, slings or other equipment used to erect the standard and other equipment shall be carefully placed to prevent scratching or abrasions. All abrasions and scratches shall be refinished.

Traffic signal pedestals and meter cabinets shall be securely bolted to the foundations in a vertical position, using stainless steel hardware.

Pedestrian push button assemblies and instruction signs shall be accurately positioned on traffic signal standards, traffic signal pedestals, controller cabinets or meter cabinets. Pedestrian push‑button assemblies shall be securely fastened with stainless steel vandal‑resistant hardware.

Controller cabinets shall be securely fastened to foundations in a perpendicular position with stainless steel hardware. When a controller cabinet is temporarily installed on the top of a meter cabinet it shall be securely fastened in a perpendicular position using stainless steel hardware. The joint between the cabinets shall be sealed with a neoprene gasket and the wireway sealed as specified in Section 601.

Traffic signal faces shall be assembled using a wrench specifically designed for that purpose. All mounting fittings shall be specifically designed to function with the unit and provide the proper clearance to aim and adjust the signal face.

Ray directors of the specified cut-off angle shall be installed inside the signal visor. The entire ray director shall be dull black and shall be attached to the visor, after proper aiming, with stainless steel sheet metal screws.

Field adjustments of ray directors and optically programmed signal heads shall be made to limit the visibility of the signal indication. Programming of the indications is subject to approval.

Attachments of the visors, backplates or adaptors shall conform and readily fasten to existing mounting surfaces without affecting the water and light integrity of the signal head.

Traffic signal assemblies shall be wired as indicated. Each signal face shall be individually wired from the terminal block to the base of the pedestal or standard, using the specified colors for each signal section.

Wire used in traffic signal assemblies, from the face to the base of the standard, shall be traffic signal cable.

Each wire termination shall be made with an insulated locking spade terminal.

All terminations in meter cabinets or controller cabinets shall be attached to barrier type terminal blocks. All terminal blocks shall be identified. All spare wires shall be terminated and identified as such.

Where joints or splices are necessary they shall be made with a compression solderless connector and be secured mechanically and electrically with the proper tool. The conductors shall be thoroughly cleaned and with a minimum of the insulation removed. All joints and splices located in pole bases shall be insulated with insulating tape and shall provide one and one‑half times the insulation equivalent to that of the original conductor. The taped joints and splices shall be thoroughly coated with an electrical grade sealant and bonding compound.

Where joints or splices are necessary in junction boxes, they shall be as specified above and insulated with resin splicing kits.

Loop detector leads shall be installed continuously from the controller to the junction box nearest to the loop. Splices will not be permitted in the loop detector lead. The connection of the loop detector lead to the loop wire shall be made with a compression solderless connector and be secured mechanically and electrically, with a proper tool. The conductors shall be cleaned with a minimum of insulation removed. All joints and splices shall be insulated with a resin splicing kit.

Traffic signal circuits shall be color coded and wired as follows:

| Table 606-7 Two Conductor Cable | | |
| --- | --- | --- |
| Function | Color | Number |
| Pedestrian Push Button | Black | 1 |
| Neutral | White | 2 |
| Table 606-8 Five Conductor Cable (Traffic Signal) | | |
| Face | Color | Number |
| Spare | Black | 1 |
| Neutral | White | 2 |
| Red | Red | 3 |
| Green | Green | 4 |
| Yellow | Orange | 5 |
| Table 606-9 Five Conductor Cable (One Pedestrian Signal) | | |
| Face | Color | Number |
| Spare | Black | 1 |
| Neutral | White | 2 |
| Don’t Walk | Red | 3 |
| Walk | Green | 4 |
| Spare | Orange | 5 |
| Table 606-10 Five Conductor Cable (Two Pedestrian Signal) | | |
| Face | Color | Number |
| Walk (2) | Black | 1 |
| Neutral | White | 2 |
| Don’t Walk | Red | 3 |
| Walk | Green | 4 |
| Don’t Walk (2) | Orange | 5 |
| Table 606-11 Ten Conductor Cable (Traffic Signal) | | |
| Face | Color | Number |
| Green Arrow (spare) | Black | 1 |
| Neutral (1) | White | 2 |
| Red (1) | Red | 3 |
| Green (1) | Green | 4 |
| Yellow (1) or Yellow Arrow | Orange | 5 |

Where loop detectors are to be installed, it shall be necessary to saw cut in the roadway a channel of the dimensions and shape indicated by the Plans. An access channel shall be saw cut from each loop to the edge of the roadway. The corners of the loops shall be cut diagonally to ensure a clean smooth radius. All cuts shall be accomplished in a single pass with circular pavement‑cutting saw.

The channel shall be blown free of debris and moisture after the trench has been cut. If the loop wire is not immediately installed, a filler shall be installed to prevent the channel from collapsing.

The wire forming the loop shall be continuous throughout its length, and installed without splices or joints. The loop wire shall extend from the channel to the nearest junction box. At this point it shall be connected to the loop detector leads as previously specified.

The loop detector wire shall be installed in the following manner. After the channel is blown free of debris and moisture, the turns of wire shall be laid in the channel so that there are no kinks or curls, and no straining or stretching of the insulation around the corners of the channel or in the junction box. A piece of wood with rounded corners shall be used to seat the wire in the bottom of the channel. After the wire is placed, it shall be rechecked for slack, raised portions or tightness. If any of the foregoing are found, they shall be corrected.

The two wires, which form the lead‑in wires, shall be twisted together in the loop channel and conduit to the nearest junction box.

After testing the loop, the channel shall be sealed with a joint sealant applied according to the manufacturer’s instructions. The joint sealant shall not be placed in the channel at temperatures below 45 ºF or during precipitation of any kind. The channel shall be completely filled with the joint sealant and there shall be no air bubbles below the surface. Joint sealant that is accidentally applied to the roadway shall be removed. The joint sealant must be sufficiently hardened before traffic is permitted to move over the area.

At those locations where the saw cuts are in a roadway that slopes, the joint sealant shall be applied in a manner that prevents the joint sealant from running out of the trench and on to the roadway.

When the roadway in the area of the loop detectors is to be resurfaced, work shall be scheduled to install the loop detector immediately below the top layer of the surface course. The joint sealant must be hardened before the installation of the pavement.

If a loop is installed on a grade steeper than three percent, the joint sealant shall be sealant Type 1.

606.04 Assumption of Maintenance

A traffic signal system at an intersection is to be considered as a separate entity, and maintenance and operational responsibility for the signal may be accepted by the Authority before Completion. Thirty days before activation of the traffic signal system, the Engineer will be notified in order that the system may be inspected to ensure that it conforms to the Contract requirements. Maintenance assumption will be considered only after all testing has been completed, defects corrected, all indications are operational and properly aimed, cables tagged, controller fully operational performing all timing functions required, and all other items of work associated with the signal are completed.

Assumption of maintenance by the Authority shall not be considered as Acceptance as described by the Subsection 109.02.

606.05 Method of Measurement

Controller assemblies of the various phases and meter cabinets of the various types will be measured by the number of units.

Traffic signal cable will be measured by the linear foot.

Pedestal, pedestrian, and traffic signal assemblies and standards of the various types will be measured by the number of units.

Push button assemblies and standards will be measured by the number of units.

606.06 Basis of Payment

Payment will be made under:

PAY ITEM PAY UNIT

Controller Assemblies, \_\_\_\_ Phase Each

Push Button Assemblies Each

Push Button Standards Each

Traffic Signal Assemblies, Type \_\_\_\_ Each

Traffic Signal Cable, \_\_\_\_ Conductor Linear Foot

Traffic Signal Standards, Type \_\_\_\_ Each

Payment for junction boxes, conduits, ground wire and service wire will be made according to [Section 601](#s701).

Payment for new traffic signal equipment, conduits, foundations and other materials used in the temporary system which are to become part of the permanent system will be made according to [Section 601](#s701) or this Section, as appropriate.

Payment for swing sign brackets shall be included in the price bid for traffic signal assemblies.

[Include the following as necessary:]

Add the following Section:

Section 607 - Detector Loop Installations

607.01 Description

The work under this section consists of furnishing and installing detector loop wires and accessories in roadway pavement or in bridge decks at the designated locations, in conformance with the details shown on the Plans, as specified hereinafter and/or directed by the Engineer.

Detector loops consist of a complete four-turn continuous wire loop installed in designated traffic lanes and extension of the loops with the lead-pair wire run through an existing conduit to an existing junction box in the berm or beneath the bridge deck for roadway or bridge installations, respectively, leaving sufficient slack to permit wiring connections at the existing junction boxes.

The work described herein will require very close coordination at all times between the Engineer, the Contractor, and the Authority. The existing detector loops may be removed as part of the milling operation. Disconnection is not required.

Detector loop installation in roadway pavement shall be made after resurfacing.

Detector loop installation on bridges shall be made subsequent to the deck surface preparations and prior to the placement of the required bridge deck membrane.

The connection of the new loops in the existing junction boxes shall be made by the Contractor under the supervision of the Authority's representatives. The Contractor shall notify the Authority in writing, through the Engineer, at least 48 hours in advance of the time the loop connections are to be made.

607.02 Materials

1. General

All materials shall be of the best quality and free from defects.

1. National Electric Code

All electrical materials shall conform to the requirements of the National Electric Code of the National Fire Protection Association or the Standard Rules of the Institute of Electrical and Electronic Engineers.

1. Wire and Cable

Detector loop wire shall be IMSA Spec. 51-5-1984 PE/Nylon, wire gauge #14 AWG available from Clifford, Inc., Bethel, Vermont or an approved equal.

1. Conduit and Fittings

Shall be rigid polyvinyl chloride (PVC) conduit and fittings, Schedule 80 in accordance with Subsection 918.08.

1. Crack Sealant

Shall be Cold Applied Sof-Seal sealant as manufactured by W.R. Meadows, York, Pennsylvania or approved equal.

1. Hold Down Material

Shall be Cera-Rod, heat resistant backer rod 2 inch diameter available from W.R. Meadows, York, Pennsylvania or approved equal.

1. Sleeving

At pavement joints shall be polyvinyl chloride tubing conforming to MIL-1-631 such as ZIP-31 All Purpose Zipper Tubing as manufactured by Alpha Wire Corp. or approved equal.

1. Epoxy Sealer

For detector loop and lead trunk cable installation shall be Fasroc/Preco available from Signal Control Products, Somerville, New Jersey, or approved equal.

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607.03 Methods of Construction

Prior to the start of installation of the detector loops the Contractor shall give the Authority at least 24 hours advance written notice of its intended schedule. Work shall be scheduled from 8:00 pm until 5:00 am the following day on any day Monday through Thursday during roadway closings.

The work shall be scheduled so that the Contractor can lay the wire and seal the slots in the same day in which the slots are made. Suitable provisions shall be made to ensure protection for vehicles and environmental effects. Under no circumstances shall vehicles be allowed to pass over an open unprotected slot.

The approximate locations of the loops are shown on the Plans and the actual location will be established by the Engineer in the field.

The Contractor shall lay out the actual loop configuration by means of template or other approved method and in accordance with the dimensions shown on the Plans.

Self-propelled or hand held concrete cutting equipment shall be utilized to make the slots into which the loop wire is to be laid. The cutting equipment shall utilize diamond or Carborundum blades to provide clean well-defined slots.

Saw cuts for the detector loop wire installation shall meet at 90 degree corners. Additionally, a core drill shall be used for rounding the corners, as shown on the Plans, in order to accommodate smooth bending of the loop wires.

Where the lead-pair from the detector loop enters the existing conduit, it shall be packed with hold down material and sealed with epoxy to the limits called for on the Plans.

Just prior to the installation of wire, the sawed slots shall be cleaned with water or air. Sawed slots cleaned with water shall then be cleaned of water and completely dried by filtered compressed air so that the slots are not contaminated by oil or water.

The saw cut slots shall then be inspected for the presence of any jagged edges or other protrusions which might damage the loop wire. Any jagged edges, persistent foreign material or protrusions remaining shall be removed in an approved manner with an appropriate special tool and the affected area recleaned.

The Contractor shall lay the loop wire within 24 hours of completion of the saw cutting of the slot.

The entire loop wiring and the lead-in wire pair between the loop and the existing junction box at each location shall be one continuous length, without a splice, and shall be installed with utmost care to eliminate any possible damage to the conductor or its insulation. Any wire damaged by the Contractor during its installation operations shall be replaced by the Contractor at its own expense.

The loop wire shall be placed in the slot where there are no kinks, curls or stressing of the insulation. A General Highway Products wire roller, Model RLR-250, or approved equal, shall be used to seat the loop wires as far down as possible within the sawed slots in the roadway resurfacing or in the bridge deck. Under no circumstances shall a screwdriver or other sharp tool be used for this purpose.

Loop wires placed in sawed slots shall be held in place by two-inch strips of the hold-down material. These strips shall be placed in the slot approximately every two feet, and left there during the pouring of the slot sealant.

The epoxy sealant for saw cut sealing shall be used strictly in accordance with the manufacturer's recommendations or instructions. When poured in the slot, the sealant shall completely surround the loop and lead-in wires displacing the air and completely filling the sawed slot shown on the Plans. After the sealant has been placed to the required depth in the saw cut slots, a check shall be made for air bubbles and such eliminated.

Prior to sealing the sawed slots, the Contractor shall check the loop wiring for continuity, insulation resistance and inductance.

Continuity tests shall be performed utilizing a volt-ohm-millimeter, Simpson Model 260-7, or approved equal.

The loop wire insulation resistance should be measured utilizing a 500 volt insulation tester, General Radio Type 1863 Megohmeter, or approved equal, between one end of the lead-pair wire and the nearest reliable electrical ground. The insulation to ground resistance shall be greater than 10 megohms.

The loop inductance shall be measured using a loop detector test set as manufactured by General Highway Products, or approved equal. The Authority's Communications Division can loan to the Contractor, upon 72 hours advance notice, an Authority-owned test set for this purpose. All requests should be made to [insert name], Manager, Telecommunications and Electronics Division at [insert phone number]. Inductance shall be between 100 and 150 microhenries for the detector loop.

After completion of the sealing of the sawed slots and prior to the connection of the lead-pair in the junction box by the Contractor, the loops shall again be tested for continuity, insulation resistance and inductance as specified above. The Contractor shall record all values. The resistance readings shall indicate satisfactory compliance with the continuity tests for each loop installation.

The loop inductance shall again be tested as a final test, using the same equipment as employed above. The inductance readings shall be between 100 and 150 microhenries. All data taken during the final test shall be recorded and submitted to the Engineer for approval.

After sealing and testing the new detector loops, but prior to splicing to the lead trunk cable, the Contractor shall notify the Authority's Telecommunications and Electronics Division [insert name] [insert phone number] a minimum of 72 hours in advance. The Authority's personnel, with the assistance of the Contractor, will then check and measure the existing lead trunk cable to insure that the cable is serviceable and the measurements conform to the following requirements.

Where the existing lead trunk cable is found to be serviceable and the test measurement values conform to the specified requirements, the new detector loop leads shall be spliced into the existing lead trunk cable by the Contractor, in the existing junction box.

However, if the existing lead trunk cable is judged to be no longer serviceable and/or the test measurement values do not conform to the requirements set forth herein, then the existing cable shall be replaced by the Contractor prior to splicing, utilizing new lead trunk cable. Should the lead trunk cable be damaged by the Contractor during its installation operations, it shall be replaced by the Contractor at its own expense, including material costs, utilizing additional new cable.

Equipment, test procedures and acceptable measurement values for the lead trunk cable (existing or new) shall conform to applicable requirements as prescribed hereinbefore for the detector loops, and to the following:

Continuity test for the lead trunk cable shall be performed by shorting the "tip" and "ring" of the cable at the ends, and observing a resistance value not exceeding 2.0 ohms.

607.04 Measurement

Detector Loop Installation will be measured by the actual number furnished and installed in place.

607.05 Payment

Payment will be made under:

PAY ITEM PAY UNIT

Detector Loop Installation Each

Lead Trunk Cable Linear Feet

Division 700 - Landscaping

NOTE TO DESIGNERS:

The following are the guidelines for seed usage for use of the design Engineer only – not to be placed in the Supplementary Specifications:

|  |  |
| --- | --- |
| Seed Type | Usage |
| Type A | To be used on slopes flatter than 3H:lV. |
|  | Not a fast germinating seed. |
|  | Fairly expensive seed. |
|  | To be used on permanent slopes. |
| Type B | Temporary seed mixture. |
|  | To be used on stockpiles, surcharge areas, etc., regardless of slope conditions. |
|  | Fast germination variety. |
|  | Relatively inexpensive seed. |
| Type C | For good lawn areas, toll plaza buildings, service areas, etc. |
| Type L | To be used on slopes 3H:lV or steeper. |
|  | Mix of a slowly germinating legume seed and a relatively quickly germinating rye seed. |
|  | Most expensive seed used on Turnpike. |
|  | To be used on permanent slopes. |
| Type P | To be used on slopes steeper than 3H:lV on the Garden State Parkway South of MP 105.0 |
|  | Cool Season Turf Mix |
|  | Includes native wildflowers and grasses into the mix to add some color interests |
|  | To be used on permanent slopes. |

Section 703 – Topsoiling

703.03 Methods of Construction

Delete the second and third paragraphs and replace them with the following:

Topsoil shall not be placed until the area to be topsoiled has been shaped and dressed. Shaping and dressing shall include grading to required lines and elevations, decompaction to a depth of six (6) inches, removal of stones two (2) inches or larger in any dimension, and the removal of all other debris such as wires, cables, loose tree roots, pieces of concrete, clods, lumps and other unsuitable material.

On slopes rated as 3H:1V or flatter if directed by the Engineer, a soil analysis shall be completed to ensure that the composition of the existing soil conforms to Subsection 919.07. If the existing soil does not conform with Subsection 919.07 then a layer of organic topsoil shall be placed in accordance with the procedures set forth in this subsection. The topsoil shall be well-graded to prevent erosion of the slope.

The topsoil shall be spread on the shaped and dressed surface in a uniform layer that will produce a compacted thickness of four to six (4-6) inches. Following initial grading, the topsoil shall be graded to fine particles using a Harley rake and hand-rakes. All surfaces shall then be compacted and free from any depressions that would collect water, conforming to the prescribed lines and grades, following the requirements set forth in the Standards for Soil Erosion and Sediment Control in New Jersey (2017) issued by the New Jersey Department of Agriculture. After shaping and grading, all trucks and other equipment shall be excluded from the topsoiled areas.

Section 704 – Seeding And Sodding

704.02 Materials

Remove the following:

Emulsified Asphalt 919.15

704.03 Methods of Construction

1. Seeding and Mulching

Delete the second paragraph and replace with the following:

When the soil to be seeded has a pH value of less than 5.8, sufficient lime shall be evenly spread to increase the soil pH value to 6.5. The pounds of lime per acre required to raise the pH of an average five (5) inch layer shall be determined through a soil analysis. Placement of lime shall follow the Standard for Management of High Acid-Producing Soils, as stipulated in the Standards for Soil Erosion and Sediment Control in New Jersey (2017).

Delete the table in this Paragraph.

1. Seeding Seasons.

Delete the first sentence in this subparagraph and replace with the following:

[Note to Designer: Replace “the dates” below with the actual dates if known.]

Seeding shall be completed within the dates as set forth in the Soil Erosion and Sediment Control Plan Certification from the local soil conservation district or in the Standards for Soil Erosion and Sediment Control in New Jersey (2017).

1. Application.

Delete the first sentence in this subparagraph and replace with the following:

[Note to Designer: Add the minimum rate below if known.]

All seed mixtures shall be uniformly sown at a minimum rate as stipulated within the Soil Erosion and Sediment Control Plan Certification from the local soil conservation district or within the Standards for Soil Erosion and Sediment Control in New Jersey (2017).

1. Hydraulic Method.

Add the following to the end of this Part:

On slopes rated at 2H:1V or flatter, a two-pass method shall be used. The first pass shall contain seed mixed with liquid fertilizer, followed by a separate pass containing a cover of hydro-mulch. The hydraulic method can be used in conjunction with other methods of erosion control, such as soil stabilization matting. Consideration should be given to areas where expedited germination is necessary to protect the integrity of the area (i.e., areas exposed to direct sunlight in the summer to prevent the seed from burning). Use of the hydraulic method may be used on slopes as directed by the Engineer. Care shall be taken to prevent slurry runoff into adjacent areas. When used in conjunction with erosion control matting, the seeding shall be placed and settled before the matting is applied to the slope. Hydroseeding shall not be conducted on slopes steeper than 2H:1V.

1. Mulching.

Delete “or salt hay” from the first sentence in the second paragraph.

Delete the third and fifth paragraphs.

Delete the sixth and seventh paragraphs and replace with the following:

Fiber mulch shall be mixed with water and applied by hydraulic equipment. The fiber mulch shall be used as recommended by the manufacturer, except that no less than 400 pounds of the dry product shall be used per acre.

No mulch shall be placed in areas designated on the Plans to receive soil stabilization matting. All mulch shall be left in place and allowed to disintegrate.

1. Care During Construction.

Delete this subparagraph and replace with the following:

The Contractor shall be responsible for a satisfactory growth of grass on all areas seeded under the Contract until final acceptance of the Contract. Any seeded area which, in the opinion of the Engineer, does not show 80% coverage, and/or has washouts or gullies, shall be reseeded by the Contractor, as directed and approved by the Engineer. Reseeding shall include the use of a slit seeder or equivalent and the placing of mulch after the new seed has been sown. The Contractor shall also remove any slide material which has been deposited on seeded areas.

1. Sodding

Delete the first paragraph and replace with the following:

Sod shall be placed immediately after the areas to be sodded have been topsoiled; limed; and fertilized in accordance with the Standards for Soil Erosion and Sediment Control in New Jersey (2017). Sod shall be harvested, and within 36 hours delivered and placed. Sod shall be laid with staggered joints and pressed closely together. The ends of sod strips shall be matched, so that the ends and sides always lie flush with each other. Sod shall be pressed into the underlying soil by hand tamping and rolling. Then the sodded areas shall be thoroughly watered.

1. Mowing

Delete the last sentence of the first paragraph and replace with the following:

Unless specifically ordered by the Engineer, grass on slopes of ratio 2 horizontal to 1 vertical (2H:1V) or steeper shall not be mowed and may be stabilized using non-turf vegetative stabilization.

Section 706 ‑ Soil Stabilization Matting

706.02 Materials

Add the following:

Soil Stabilization Matting, Jute Mesh 919.35(A)

Soil Stabilization Matting, Straw Blanketing 919.35(C)

Soil Stabilization Matting, Biodegradable Polypropylene 919.35 (D)

A field meeting with the Authority maintenance district having jurisdiction shall be held prior to the placement of soil stabilization matting. The Soil Stabilization Matting shall be netless; when conditions warrant, the use of net matting shall be used with the approval of the Authority and in accordance with the manufacturer’s recommendation.

706.03 Methods of Construction

Delete the fourth paragraph from this Subsection.

Delete the fifth and sixth paragraphs from this Subsection and replace with the following:

All soil stabilization matting shall be installed according to the manufacturer’s specifications.

The Contractor shall lightly roll the matting into the soil surface to insure complete contact with the soil at all points. The edges of every matting strip shall be stapled so as to anchor the matting flush with the ground. The Contractor shall follow the manufacturer’s installation requirements. If no anchoring requirements are provided, staples shall be spaced approximately twenty-four to thirty-six (24-36) inches on center except along overlapping edges where they shall be approximately twelve (12) inches on center. Staples may be spaced closer together on the top of the slope, at the discretion of the Engineer. Staples shall be driven at an angle of approximately 30 degrees from the perpendicular to grade and shall be driven flush with the surface of the matting. Care shall be taken so as not to form depressions or bulges in the surface of the matting. Edges of slots shall be secured by stapling ten (10) inches on center. The edges of matting strips, at channel intersections, where concentrated water flow is apt to enter from the sides shall be protected by laying a short length of matting at the foot of the entering waterway, abutting the main channel, and anchoring the ends in slots six (6) inches deep.

In areas with poor soil as defined in Subsection 703.03, the matting shall first be covered with a layer of fertilizer and lime before the second application of seeding can take place. The matting shall be left in place after the stand of grass is established only if the matting is certified 100% biodegradable. If the matting contains plastic material, it shall be removed after the root systems are established, as determined by the Engineer.

706.04 Measurement

Add the following:

For Soil Stabilization Matting that requires netting, the removal and disposal of netting will not be measured for payment.

[Note to Designer: Additional quantities of Temporary Soil Stabilization Matting shall be placed on an “if and where directed” basis for the protection of swales, edge of pavement runoff, and other exposed locations.]

706.05 Payment

Add the following:

Temporary Soil Stabilization Matting, Biodegradable Polypropylene Square Yard

Permanent Soil Stabilization Matting, Biodegradable Polypropylene Square Yard

Soil Stabilization Matting shall consist of either Straw Blanketing or Jute Mesh unless otherwise noted.

No separate payment will be made for the removal and disposal of netting of Soil Stabilization Matting that includes netting, but the costs thereof will be included in the unit price bid for the pay item.

Section 711 - Irrigation System

711.02 Materials

Delete the third paragraph and replace it with the following:

Manual shut‑off valve shall be a copper sweat ball valve, 2 inches or smaller.

Division 800 - Traffic Control

NOTES TO DESIGNER:

Authority-installed closings shall be as noted on the plans.

Taper Points for Lane Closings shall be included in the Plans, or in Paragraph 801.03(D) below of the Supplementary Specifications. The points shall be included in list or table form. For Contracts where taper points will be given by the Operations Department during construction, the Designer shall include appropriate language to be approved by the Project Engineer and the Operations Department.

Work that can only be accomplished through slow-downs shall be determined during design and included in the Plans.

The Project Engineer will determine whether Full-Time, Part-Time, or No Traffic Protection Patrol is required per 801.03(A)(7) and the Manual for Traffic Control in Work Zones. Language specifying which Type and amount of proposal Man Hours shall be included in Paragraph 801.03(D).

Any exceptional, Project-specific requirements and restrictions shall be inserted into Paragraph 801.03(D).

Section 801 – Traffic Control On Authority Roadways

801.02 Materials

Delete the following:

Impact Attenuator (Quadguard) 524

Add the following:

Concrete Mounted Delineators 923.18(A)

Re-Directive Impact Attenuator 920.20

Cone Truck 920.21

Portable Longitudinal Steel Barrier 920.22

Specific to portable longitudinal steel barrier, the Contractor shall submit the manufacturer’s certificates of compliance in accordance with Subsection 105.04 and shall include the following information:

1. Product Trade Name
2. Anchoring details and allowable deflection distances for MASH TL-3.
3. Installation requirements and procedures.

801.03 Methods of ConstructionNOTE TO DESIGNER: Insert all holiday and lane closing restrictions here under 801.03(D) (as approved by Authority Operations Department).

1. General Provisions
2. State Police Authority

Delete the first paragraph and replace it with the following:

Traffic on Authority roadways is under the direct supervision and control of the New Jersey State Police who will enforce all statutory laws including the Authority's established Regulations under the Subchapter titled “Traffic Control On, And Use Of, New Jersey Turnpike Authority Property”, as they pertain to the Contractor as well as to the traveling public. The regulations can be found on the Authority’s website <https://www.njta.gov/about/regulations-and-policies/>. The Contractor shall become familiar with and adhere strictly to the requirements of these Regulations.

1. Traffic Permit

In the first paragraph, delete the third sentence and replace it with the following:

A Traffic Permit Application can be found on the Authority’s website at <https://www.njta.gov/forms-records/traffic-permits/>

1. Closings, Slowdowns, and Escorts

Delete the ninth paragraph and replace it with the following:

The traffic protection devices for closing of a lane, shoulder, or ramp shall always be set up progressively in the direction of traffic from the cone truck and TMA traveling in the lane or shoulder being closed. The protection devices shall always be removed in the reverse order by the truck backing up on the closed lane, shoulder, or ramp. Proper flashing amber lights shall be installed on all construction vehicles in accordance with Subsection 920.13. Closing or opening operations along lane, shoulder, or ramps require at least a six (6) person team consisting of a TMA and cone truck with a four (4) person crew, and additional construction vehicles and workers as required for installing signs and arrow boards. The Engineer will coordinate the procedures for closing or opening a lane, shoulder, or ramp

1. Traffic Control Devices

[Include the following in all Contracts that include precast concrete construction barrier:]

1. Construction Barrier

Delete this Subparagraph in its entirety and replace it with the following:

Construction barrier shall be either precast concrete construction barrier or portable longitudinal steel barrier as defined below. Contractor shall not intermix precast concrete construction barrier and portable longitudinal steel barrier. Unless the contract documents specify otherwise the Contractor may use either Precast Concrete Construction Barrier or Portable Longitudinal Steel Barrier that provides working widths consistent with the requirements of the Contract Documents.

1. Precast Concrete Construction Barrier

Precast concrete construction barrier shall be inspected and approved by the Engineer prior to delivery to the job site. The precast concrete construction barrier shall meet the criteria set forth below. The Engineer will be the sole judge of the acceptability of the precast concrete barrier. Precast concrete barrier deemed unsatisfactory by the Engineer shall not be used. Precast concrete barrier that is damaged or deteriorates during the course of the Project shall be replaced at no additional cost to the Authority.

Where different joint classifications are required within a section of barrier, the controlling joint class shall extend beyond the area required for limited deflection as noted in the following table:

|  |  |
| --- | --- |
| **PCCB - Transition Between Joint Classes** | |
| **Joint Class Transition** | **Transition Requirements** |
| D to C | Extend one complete barrier section of Joint Class D beyond the work area requiring limited deflection. |
| D to B  D to A | Extend one complete barrier section of Joint Class D beyond the work area requiring limited deflection and pin the first hole of the Joint Class A or B barrier section on the traffic side of the PCCB. |
| C to B  C to A | Extend one complete barrier section of Joint Class C beyond the work area requiring limited deflection and pin the first hole of the Joint Class A or B barrier section on the traffic side of the PCCB. |
| B to A | Extend Joint Class B box beam stiffing for 50 ft. minimum beyond the work area requiring limited deflection. |

The concrete construction barrier may be installed after the removal of existing surfacing and removed prior to paving, unless otherwise shown on Plans, if site conditions and construction sequence require doing so.

The Contractor shall furnish all hardware, concrete barrier interlock devices, grouting, box beam and associated hardware, anchors and all else necessary for the complete installation and subsequent removal and/or relocation of the concrete barrier. Concrete barrier shall be installed on a uniform surface free from vertical projections and drop-offs and free from fixed objects for the maximum barrier deflection distances for the joint class as indicated on the plans. Except as approved by the Engineer the Contractor must maintain the minimum clear area behind the barrier free from personnel, equipment, and material.

The Contractor shall be required to maintain the concrete barrier units in their correct alignment at all times. The Contractor shall promptly furnish (any time of the day or night upon notification from the Authority, State Police or the Engineer) all labor, materials and equipment as necessary to repair, reset and/or realign any portion of concrete barrier units damaged or displaced by traffic incidents or otherwise. All Contractor-furnished devices shall remain the property of the Contractor and shall be removed by the Contractor upon completion of the work.

All precast concrete construction barrier that does not meet the following criteria, as determined by the Engineer prior to placement on the roadway, shall be rejected for use:

* No more than three cracks in the middle 6 feet of the barrier.
* All cracks must be less than ⅛ inch wide.
* No gouges in the lower half of the face exposed to traffic.
* No reinforcing steel shall be exposed.
* The keyway must be intact.
* Lifting devices shall be intact.
* Face exposed to traffic must be clean of all road dirt.
* Concrete barrier delineators shall be in place.
* Interlock must accept key full depth without Projection of key cap above barrier.
* The full keyway must be available.

Precast concrete construction barrier that becomes damaged shall be replaced within 24-hours, as directed by the Engineer.

The Contractor shall clean and maintain the drainage slots at the bottom of the concrete construction barrier at all times as directed by the Engineer.

1. Portable Longitudinal Steel Barrier

Portable longitudinal steel barrier delivered to the job site shall be in new condition and maintained throughout the duration of the Project. The Engineer will determine the acceptability of the steel barrier. Steel barrier deemed unsatisfactory by the Engineer shall not be used. Steel barrier that is damaged during the course of the Project shall be replaced at no additional cost to the Authority.

All portable longitudinal steel barrier that does not meet the following criteria, as determined prior to placement on the roadways, shall be rejected for use:

* + - * Barrier shall not be modified (cut, drilled, or penetrated) except as approved by the manufacturer.
      * Barrier shall be free from manufacturing defects and visible deformation (bends, indentures, tearing, or buckling).
      * The barrier connection ends shall be intact.
      * Anchor slots shall be intact.
      * Lifting devices shall be intact.
      * Barrier shall have no visible evidence of corrosion or lack / loss of galvanization.
      * Barrier face exposed to traffic must be clean of all road dirt; cosmetic damage to the barrier such as paint or tire blemishes shall not be cause for rejection.
      * Reflectors shall be in place.

Portable longitudinal steel barrier may be installed after the removal of existing surfacing and removed prior to paving, unless otherwise shown on Plans, if site conditions and construction sequence require doing so.

The Contractor shall furnish all hardware, anchors, and all other components necessary for the complete installation and subsequent removal and/or relocation of the portable longitudinal steel barrier system. Steel barrier shall be installed on a uniform surface free from vertical projections and drop-offs for the entire length of the system as per the manufacturer’s specified tolerances. The steel barrier system shall be free from fixed objects for the maximum barrier deflection distances as indicated on the plans. Except as approved by the Engineer the Contractor must maintain the minimum clear area behind the steel barrier free from personnel, equipment, and material.

The Contractor shall be required to maintain the portable longitudinal steel barrier units in their correct alignment at all times. The Contractor shall promptly furnish (any time of the day or night upon notification from the Authority, State Police or the Engineer) all labor, materials and equipment as necessary to repair, replace, reset and/or realign any portion of the steel barrier units damaged or displaced by traffic incidents or otherwise. All Contractor-furnished devices shall remain the property of the Contractor and shall be removed by the Contractor upon completion of the work.

Portable longitudinal steel barrier that becomes damaged shall be replaced within 24-hours, as directed by the Engineer.

The Contractor shall clean and maintain the drainage slots at the bottom of the portable longitudinal steel barrier, as applicable, at all times as directed by the Engineer.

All relevant references to “Precast Concrete Construction Barrier” and “PCCB” in the plans and specifications shall by extension be applicable to “Portable Longitudinal Steel Barrier”.

1. Modular Glare Screen System

Delete the first paragraph and replace it with the following:

Within isolated deck replacement areas and at parapet replacement areas, a Modular Glare Screen System with screening shall be installed on top of the barrier at locations shown on the Plans. The Modular Glare Screen System is required at isolated deck replacement areas scheduled for a Stage that is permitted for a period of four (4) days or greater and at all parapet replacement areas.

Delete the third paragraph and replace it with the following:

The Modular Glare Screen System shall extend for the full length of the barrier (except on taper sections) adjacent to deck breakouts as shown on the Plans.

Delete Part 801.03(C)(4) and replace it with the following:

1. Temporary Impact Attenuators (Array)

Temporary Impact Attenuators (Array) refer to non-redirective sand-filled polyethylene plastic frangible modules. Temporary impact attenuator modules which are lost, stolen, damaged, destroyed or determined by the Engineer to be unacceptable shall be replaced without additional compensation.

Attenuators shall be installed in accordance with the manufacturer’s directions and as indicated on the Plans. Attenuator system designs are independently evaluated for MASH compliance and unless indicated by the attenuator system manufacturer, components from different attenuator systems are not to be interchanged.

The Contractor shall be responsible for preparing the surface to the dimensions and grades as shown on the Plans and as required by the attenuator system manufacturer on which the attenuator will be installed.

Install the attenuator according to the manufacturer’s directions for the type of obstruction being shielded and the type of transition being used. The Contractor shall be certified in accordance with the manufacturer’s requirements to perform installation.

The Contractor shall notify the Engineer immediately upon discovery of any damaged temporary impact attenuator module and shall immediately replace or repair all damaged modules. The Contractor shall have on the Project an adequate number of spare modules to repair any damaged attenuator unit. Any modules of a unit or sand which are damaged due to the Contractor’s carelessness while placing, or due to the operation of the Contractor’s equipment or personnel after such placement, shall be replaced at no additional cost to the Authority.

All new material shall be furnished, except where resetting or salvaging is called for on the Plans.

Delete Part 801.03(C)(5) and replace it with the following:

1. Temporary Re-directive Impact Attenuators

Temporary Impact Attenuators (Cartridge) and Temporary Impact Attenuators, Type \_\_\_\_ refer to re-directive impact attenuators and transitions as identified on the Plans.

For re-directive impact attenuators installed in a construction zone on a temporary basis, work shall also include the maintenance of the attenuator during construction, repair or replacement during construction, relocation to a different area, removal upon completion and the restoration of pavement after removal.

Refer to Section 524 for additional requirements.

1. Truck with Mounted Attenuator (TMA)

Delete this Subparagraph in its entirety and replace it with the following:

This item shall also include placing, moving, and removing the TMA unit as necessary when the Contractor is working within a closed shoulder or lane. The TMA shall be removed from the closed shoulder or lane when no work is in progress.

The Contractor shall provide a TMA as a barrier vehicle in the closed lane or closed shoulder preceding each work location where personnel are engaged in construction activities and no concrete barrier is called for.

The appropriate number of TMAs, as shown on the Plans, are to be provided for work on this Contract. The TMAs shall remain the Contractor’s property upon Contract completion. If the Contractor elects to work at more than one location requiring a TMA, he shall furnish additional TMAs at no additional cost to the Authority.

The TMA layout (positioning) shall conform to the requirements set forth in the section on Truck Mounted Attenuators in the most recent Edition of the AASHTO Roadside Design Guide.

Any units or parts of the truck mounted attenuator which are damaged or become inoperable during construction shall be repaired or replaced. A complete replacement module and the required components for restoration shall be available at all times on the project without additional compensation.

The vehicle lights shall run continuously whenever the truck is performing closing and opening operations.

In the event that the TMA is hit during the process of the work and the crash cushions become damaged or inoperable, the Contractor shall have a replacement cartridge on the site at all times and shall immediately repair the truck mounted crash cushions. The replacement cartridge shall be compatible with the original unit so that the repair can be accomplished in a minimal amount of time.

The Contractor shall have a truck mounted attenuator with a driver available at the request of the Engineer for the purpose of inspection, condition assessment, layout of “If and Where Directed” work, “Change Order”, and/or “Emergency Work” and for the Final Inspection. It is anticipated that the truck mounted attenuator with the driver will be needed a minimum of four (4) hours and no more than eight (8) hours per request with a twelve (12) hour advance notice by the Engineer. Payment for costs associated with this work shall be in accordance with “Furnishing Truck Mounted Attenuator for Engineer’s Use”, or shall be included in the unit costs of the various pay items within Division 800.

1. Cone Trucks

Delete this Subparagraph in its entirety and replace it with the following:

All lane, shoulder, and ramp closing operations shall be performed with a minimum of three (3) vehicles consisting of a cone truck, a truck with mounted attenuator (TMA) in accordance with 801.03(C)(6), and auxiliary vehicle(s) for sign(s) and arrow board(s).

The cone truck shall be equipped with vehicle lights per Subsection 920.13. The vehicle lights shall run continuously whenever the cone truck is performing closing or opening operations.

The cone truck when actively installing or removing taper shall only be responsible for cones and shall not stop for signs or arrow boards. The installation or removal of signs or arrow boards located within a taper shall require an additional vehicle. The TMA shall not be used to store signs or other devices.

The crew of the cone truck includes three workers on the back of the cone truck, and the driver for a minimum four (4) person crew. One of the workers on the back of the cone truck is the traffic observer. The second worker on the back of the cone truck retrieves and delivers the devices to and from the worker basket and the third worker on the back of the cone truck deploys or retrieves the devices from the roadway.

The traffic observer shall be positioned on the cone truck in a location that allows unobstructed view and in the immediate vicinity of an emergency air horn, whistle, intercom or other audible device in case of an emergency. The sole responsibility of the traffic observer shall be to observe traffic and the crew, and this person shall activate the emergency audible device as a warning to indicate a threat to the crew or operation.

The use of the cone truck, and traffic observer during closing and opening operations is mandatory and no exception shall be made. At all times the cone truck shall operate in conjunction with a TMA and sufficient additional construction vehicles to ensure the closing and opening operation are performed in a continuous manner without stopping of the TMA or cone truck.

Under no circumstance shall a cone truck remain in a closed lane, shoulder, or ramp during non-working hours or a period of inactivity.

Add the following Paragraph:

1. Holidays, Restrictions, and Special Provisions

[Insert text as necessary]

801.04 Measurement

Replace the second thru fifth paragraphs with the following:

**Furnishing Construction Barrier** will be measured by the linear foot along the front vertical face of the barrier, including tangent and taper runs, as it is used on the project, and the quantity will be limited to the maximum linear footage that is installed simultaneously on the project. Provisions for joint interlocking devices; reflectors; shimming and leveling; blockouts; grouting joints; anchorages into pavement; restoring roadway surfaces following barrier removal; lifting devices; flashing lights; the labor, materials and equipment for transportation and delivery to the project site; furnishing test results or service history for approval by the Engineer, and any incidentals required in supplying the required quantity of construction barrier to the Project will not be measured separately for payment.

**Placing and Removing Construction Barrier** will be measured by the linear foot along the front vertical face of the barrier, including tangent and taper runs, as it is installed in its properly assembled final alignment and subsequently removed. The barrier shall not be measured twice to account for subsequent removal. Labor for loading and unloading of units; trucks; all trailers; all heavy machinery and other equipment required to place and remove the barrier as prescribed will not be measured separately for payment. Relocating construction barrier as a result of accidents will be paid under the established pay item in the Contract or on a cost-plus basis as specified in Subsection 108.04 or on such other basis as agreed upon by the Contractor and the Engineer. Relocating construction barrier to gain access to a work area will not be measured separately for payment.

**Resetting Construction Barrier** will be measured by the linear foot along front vertical face of the barrier, including tangent and taper runs, actually shifted when an existing barrier alignment is to be modified as shown on the Staging Plans, or as directed by the Engineer or for staged construction. Resetting construction barrier will only apply to barrier that had been previously installed on the Project and must be relocated to a new location a minimum of seven (7) feet adjacent to the previous location for staged construction. Resetting of barrier to a location less than seven (7) feet will not be measured separately for payment. Resetting of barrier that requires the loading of units onto a truck and unloading of same shall be measured under the item “Placing and Removing Construction Barrier”. Resetting construction barrier as a result of accidents or to gain access to a work area will not be measured separately for payment.

**Modular Glare Screen System** along the top of construction barrier as directed by the Engineer will be measured for payment by the linear foot of system furnished, installed and maintained along the tangent section of barrier in each location as prescribed. Removal and subsequent installation of the modular guidance system and screening for the purpose of placing, relocating or removing the barrier will not be measured separately for payment. Furnishing, installing and maintaining of the screening will not be measured separately for payment.

Delete the eighth paragraph and replace it with the following:

**Furnishing Portable Variable Message Sign** will be measured by the number of each and will be limited to the maximum number provided in the Contract, which is installed simultaneously, plus one spare sign which must be retained by the Contractor for use in this Contract. Sign placement, removal and maintenance will not be measured separately for payment.

Delete the nineth paragraph and replace it with the following:

**Furnishing Temporary Impact Attenuator (Array), \_\_\_ MPH** will be measured by the number of each complete unit (barrel configuration) installed to the maximum number provided in the Proposal that are installed simultaneously.

Delete the tenth paragraph and replace it with the following:

**Placing and Removing Temporary Impact Attenuator** **(Array), \_\_\_\_ MPH** will be measured by the total number of complete units placed in each location as prescribed by the plans and as accepted by the Engineer. Removal, relocating or resetting of temporary impact attenuators will not be measured separately for payment.

Delete the eleventh paragraph and replace it with the following:

**Repair** **and Reset Temporary Impact Attenuator** **(Array), Module** will be measured by the total number of modules requiring replacement or repairs in each barrier system, either damaged or destroyed by the traveling public and as directed by the Engineer. Modules damaged by Contractor operations will not be measured for payment.

Delete the nineteenth paragraph and replace it with the following:

**Furnishing Temporary Impact Attenuator (Cartridge), \_\_\_Bays, \_\_\_” Wide** will be measured by the number of each complete unit installed to the maximum number provided in the Proposal that are installed simultaneously.

Add the following to the end of the Subsection:

**Placing and Removing Temporary Impact Attenuator (Cartridge)** will be measured by the total number of complete units placed in each location as prescribed by the plans and as accepted by the Engineer. Removal of temporary impact attenuators will not be measured for payment.

**Repair and Reset Temporary Impact Attenuators (Cartridge)** will be measured by the number of each complete unit to be replaced or repaired, either damaged or destroyed by the traveling public and as directed by the Engineer. Units damaged by Contractor operations will not be measured for payment.

**Furnishing Temporary Impact Attenuator, Type \_\_\_** will be measured by the number of each complete unit installed to the maximum number provided in the Proposal that are installed simultaneously.

**Placing and Removing Temporary Impact Attenuator, Type \_\_\_** will be measured by the total number of complete units placed in each location as prescribed by the plans and as accepted by the Engineer. Removal of temporary impact attenuators will not be measured for payment.

**Repair and Reset Temporary Impact Attenuators, Type \_\_\_** will be measured by the number of each complete unit to be replaced or repaired, either damaged or destroyed by the traveling public and as directed by the Engineer. Units damaged by Contractor operations will not be measured for payment.

NOTE TO DESIGNER: For Lane Closings, use one of the following two clauses. Unless otherwise directed, lane closings shall be measured by each for Contracts with tight schedules wherein lane closings are quantifiable (e.g. bridge repair Contracts). For Contracts where the number of lane closings is dependent upon the Contractor’s means and methods, lane closings shall be included under Furnishing Traffic Control Devices.

Add the following to the end of this Subsection:

Installation, Maintenance, and Removal of Lane Closing will be measured by the number of each or percentage thereof (as described in Subsection 801.05), installed, maintained, and removed. See Subsection 801.05 for payment of Supplementary Lane Closings. Lane or shoulder closings for “Force Account”, “If and Where Directed by the Engineer”, “Change Order” or “Emergency” work will be measured in accordance with Subsection 108.04.

OR

No separate payment will be made for lane closings and supplementary lane closings, but the costs thereof will be included in the unit price bid for the pay item “Furnishing Traffic Control Devices.”

NOTE TO DESIGNER: If directed by the NJTA Project Engineer, the following item may be used in lieu all pay items in this Section.

Replace the entire Subsection with the following:

Maintenance and Protection of Traffic will be measured on a lump sum basis and shall include all equipment, labor material or expense to install, maintain and remove maintenance and protection of traffic for the Contract.

801.05 Payment

The following items are removed:

PAY ITEM PAY UNIT

Furnishing Temporary Impact Attenuator Each

Placing And Removing Temporary Impact Attenuator Each

Repair Temporary Impact Attenuators Barrel

Furnishing Precast Concrete Construction Barrier Linear Foot

Placing And Removing Precast Concrete Construction Barrier Linear Foot

Resetting Precast Concrete Construction Barrier Linear Foot

Add the following items:

PAY ITEM PAY UNIT

Furnishing Temporary Impact Attenuator (Array), \_\_\_\_mph Each

Placing And Removing Temporary Impact Attenuator (Array), \_\_\_\_mph Each

Repair And Reset Temporary Impact Attenuator (Array) Module Each

Furnishing Temporary Impact Attenuator (Cartridge), \_\_ Bays, \_\_” Wide Each

Placing And Removing Temporary Impact Attenuator (Cartridge) Each

Repair And Reset Temporary Impact Attenuator (Cartridge) Each

Furnishing Temporary Impact Attenuator, Type \_\_\_\_ Each

Placing And Removing Temporary Impact Attenuator, Type \_\_\_\_ Each

Repair And Reset Temporary Impact Attenuator, Type \_\_\_\_ Each

Furnishing Construction Barrier Linear Foot

Placing And Removing Construction Barrier Linear Foot

Resetting Construction Barrier Linear Foot

Delete the tenth paragraph after the pay item table and replace it with the following:

No separate payment will be made for repairing impact attenuator modules damaged by Contractor operations.

Delete the thirteenth paragraph after the pay item table and replace it with the following:

Payment for permanent Impact Attenuators to remain shall be in accordance with Subsection 524.05.

NOTE TO DESIGNER: Include the following pay item if lane closings are paid individually.

Add the following item:

PAY ITEM PAY UNIT

Installation, Maintenance and Removal of Lane Closings Each

NOTE TO DESIGNER: If directed by the NJTA Project Engineer, the following item may be used in lieu all pay items in this Section.

Add the following item:

PAY ITEM PAY UNIT

Maintenance and Protection of Traffic Lump Sum

NOTE TO DESIGNER: Include the following if lane closings are paid individually.

A partial payment of 25% of the unit price bid for the pay item **“Installation, Maintenance, and Removal of Lane Closing”** will be made for the following closings:

* Supplementary lane closings installed adjacent to a right or left lane closing.
* Short duration lane closings required prior to or following the primary lane closing (pre and post closings) for temporary striping, concrete barrier placement and removal, and striping restoration.
* Lane closings that are cancelled or delayed by the Authority after the Contractor is mobilized.
* Ramp closings including those required in conjunction with mainline closings and pre and post ramp closings.
* Extension of an existing lane closing, as directed by the Engineer to perform additional work.
* The length of extension is anticipated not to exceed one mile.
* Shoulder Closings (those not requiring lane shifts).

Lane closings for lane shift installations will be paid for at 100% of the unit price bid for the pay item **“Installation, Maintenance, and Removal of Lane Closing”,** regardless of the number of lanes shifted.

Short duration lane closings required on mainline roadways for installation and removal of catches on overhead structures will be paid for at 100% of the unit price bid for the pay item **“Installation, Maintenance, and Removal of Lane Closing”.**

Supplementary right or left lane closings installed adjacent to right or left shoulder closings will be paid for at 100% of the unit price bid for the pay item **“Installation, Maintenance, and Removal of Lane Closing.”**

Payment for mainline shoulder and half-ramp closings will be made for only those closings noted in the staging write-up and will be paid for under the pay item **“Installation, Maintenance and Removal of Lane Closing.”** All other closings (i.e. partial or short sections of ramp closings) will not be paid for separately.

Section 802 ‑ Standby Wrecker Service

802.03 Methods of Construction

Add the following language to the end of this Subsection:

NOTE TO DESIGNER: Insert Project Limit mileposts, or mileposts deemed applicable.

Standby wrecker service may be performed only by New Jersey Turnpike Authority authorized firms that operate on the New Jersey Turnpike <or Garden State Parkway> from Milepost < > to Milepost < >.

Add the following language to the end of this Subsection:

[Include the following as approved by the Project Engineer.]

Heavy duty wrecker service shall be provided during Peak Hours as follows:

During the hours 6:00 a.m. to 9:00 a.m. and 4:00 p.m. to 7:00 p.m., Monday through Friday, drop- off locations for disabled vehicles and patrons shall be at < >. U-turns performed by wreckers shall be as indicated in the Subparagraph 801.03(A)(3), the Contract Documents, or as directed by the Engineer.

Light duty wrecker service shall be available on an on-call basis.

802.04 Measurement

Replace the entire Subsection with the following:

[Include the following as approved by the Project Engineer.]

**Standby Wrecker Service, Light Duty (NO-BID) and Standby Wrecker Service, Heavy Duty (NO-BID)** will be measured by the hours that the wrecker is on duty on Authority roadways, or on a lump sum basis, as shown in the schedule of items.

802.05 Payment

Replace the pay item table with the following:

[Include the following as approved by the Project Engineer.]

PAY ITEM PAY UNIT

Standby Wrecker Service, Light Duty (No-Bid) Hour

Standby Wrecker Service, Light Duty (No-Bid) Lump Sum

Standby Wrecker Service, Heavy Duty (No-Bid) Hour

Standby Wrecker Service, Heavy Duty (No-Bid) Lump Sum

Section 803 – State, County And Local Roadways

803.01 Description

Add the following language to the end of this Subsection:

1. Local Traffic

Traffic control for work on State, County and Local owned roadways shall be in accordance with the NJDOT’s Standards. These Standards are available through the Department at 1035 Parkway Avenue, Trenton, New Jersey 08625 or through their web site at <https://www.state.nj.us/transportation/eng/>. Construction permits shall be required from the NJDOT prior to starting any work on State owned roadways as per Subsection 107.01.02 of the latest version of the NJDOT Standard Specifications and Appendix (Designer to modify) – NJDOT Application for Highway Occupancy of this Supplementary Specification. State owned roadways shall be kept open to traffic unless otherwise approved or shown on the Plans. The Contractor shall be responsible for obtaining permits for work affecting roadways or right-of-way under the New Jersey Department of Transportation or local municipality jurisdiction.

Construction over or adjacent to local roadways and sidewalks requires temporary lane, shoulder and sidewalk closings. Closings are required for installation of temporary shielding systems, bridge deck repairs and resurfacing, parapet replacement, (Designer to modify) and any other work as specified at each structure in the Contract Plans.

803.03 Methods of Construction

Add the following to the end of this Subsection:

NOTE TO DESIGNER: Include agency contact information here. Complete chart as required

| Table 803-1 Local Agency Contact Information | | | |
| --- | --- | --- | --- |
| Agency | Contact Name | Telephone No. | E-mail Address |
|  |  |  |  |
|  |  |  |  |

803.04 Measurement

Replace the entire Subsection with the following:

NOTE TO DESIGNER: If directed by the NJTA Project Engineer, the following item may be used in lieu of the Standard pay items:

Maintenance and Protection of Traffic on State, County, and Local Roadways will be measured on a lump sum basis and shall include all equipment, labor, material, or expense to install, maintain and remove maintenance and protection of traffic for the Contract.

803.05 Payment

Replace the pay item table with the following:

NOTE TO DESIGNER: If directed by the NJTA Project Engineer, the following item may be used in lieu of or in addition to the standard payment items:

PAY ITEM PAY UNIT

Maintenance and Protection of Traffic on State, County, and Local Roadways Lump Sum

Section 804 – Railroads

[Include the following in any contracts requiring coordination with railroad agencies:]

804.03 Methods of Construction

Delete the last paragraph in this Subsection in its entirety and replace it with the following:

The Contractor is alerted to the fact that securing the services of railroad flagging requires extensive coordination and advance notice with the affected railroad companies. The Contractor shall determine during the bidding process the availability of flagging. The Contractor shall be prepared to perform weekend work when flagmen or track outages are typically more available. The Contractor is required to provide a schedule of coordination efforts with the railroads in accordance with Subsection 104.08.

Add the following prior to Paragraph (A):

Maintenance and protection of railroad traffic may also be required for “If and Where Directed by the Engineer” work, change order work and/or emergency work.

1. Consolidated Rail Corporation (CONRAIL)

Delete this paragraph in its entirety and replace it with the following:

Prior to conducting any work on, over or adjacent to CONRAIL Right of Way, the Contractor shall: obtain a fully executed Permit to Enter (PTE), Construction Agreement or other appropriate agreement(s) prepared by CONRAIL; pay all fees; have all insurances approved; complete required safety training; and receive permission from the appropriate CONRAIL representative, provided in Subsection 104.08 to begin work. The Contractor shall give notice to CONRAIL’s representative not less than fourteen (14) days in advance of the date work is to commence, if separate from execution of the agreement.

With respect to CONRAIL’s facilities, the Contractor shall conduct their work in conformance with applicable requirements detailed in the most recent editions of CONRAIL publications:

• Specifications For Wireline Occupancy Of Consolidated Rail Corporation Property (CE-4)

• Specific Requirements Of Consolidated Rail Corporation For Work On Its Right Of Way (CE-6)

• Specifications For Pipeline Occupancy Of Consolidated Rail Corporation Property (CE-8)

• Specifications For Design And Construction Of Undergrade Railroad Bridges For Grade Separation Projects (CE-12)

CONRAIL is in continuous operation 24 hours a day, 7 days a week. The work under this Contract shall not cause interference to CONRAIL train traffic.

The Contractor shall apply for a “Temporary License Permitting Entry on Property” prior to entering on or working over CONRAIL property. Requests for right-of-entry shall be sent to Ms. Francine Monteleon, 330 Fellowship Road, 3rd Floor, Mount Laurel, NJ, 08054, phone (856) 231-2454, e-mail Francine.Monteleon@Conrail.com. This application for right-of-entry shall be made a minimum of three (3) months prior to desired start of work; the most current version of the right-of-entry application can be found on CONRAIL’S website (https://conrail.com/safety/working-on-conrail-property/). A separate PTE is required for each location.

The Contractor shall provide an advance deposit for all anticipated CONRAIL costs including engineering review, inspection, flag protection, and billing. Additionally, the need for a CONRAIL flagman will be determined by a CONRAIL’s representative. A CONRAIL Force Account Estimate (FAE) will be composed upon receipt of the Contractor’s schedule.

The Contractor, its agents, consultants, contractors, and sub-contractors shall submit insurance certificates in compliance with insurance requirements set forth in CE-6. Insurance certificates shall be submitted to insurancecertificates@conrail.com for review and approval.

The Contractor and all personnel that will be working with CONRAIL right-of-way are required to attend a safety course provided by CONRAIL, paid by the Contractor, prior to working within CONRAIL right-of-way and in accordance with CONRAIL CE-6.

In addition to the requirements of CONRAIL’s CE-6, the Contractor is required to comply with the following when providing an entry permit, work plan, shielding and containment designs, and other submittals:

1. Clearly identify Contractor temporary means of access on CONRAIL property if required to perform work. No equipment or material shall be stored on CONRAIL property. No equipment shall be refueled on CONRAIL property.
2. Temporary catch systems over CONRAIL facilities shall be designed for a minimum of 100 pounds per square foot.
3. Temporary containment structures over CONRAIL facilities shall be designed for a minimum of 50 pounds per square foot plus the weight of any load to be carried (e.g. equipment, workers, etc.). A cross-section is required with any plan submittal that shows the vertical clearance from the top of rail to the bottom of the sag for containment.
4. Any sandblasting over or adjacent to CONRAIL’s right-of-way will require complete containment and recycling. Methods and plans for sandblasting over CONRAIL’s right-of-way shall be included in the Shop Drawings. Debris is not permitted to fall onto CONRAIL’s right-of-way.
5. Plans submitted shall show where the expected staging area is located with horizontal clearances to the centerline of track noted.
6. CONRAIL inspectors and maintenance personnel require access to the track throughout construction.
7. Provide an estimated schedule for each activity listed in the work plan.
8. Provide a detailed work plan for assembling and disassembling the suspended platform containment structure.
9. Provide a detailed work plan for assembling and disassembling the bridge-to-grade containment structure.
10. The work plan shall show how the beams will be accessed for the selected containment method.
11. The access plan is to show how equipment is crossing over the tracks for each respective track. Note the tracks may only be crossed at existing grade crossings. Track designations including mile posts shall be clearly identified with all submittals.
12. Submit catalog cuts for the tool vehicle, blastpot, air compressors, dust collector, and any other driven or stationary equipment to be used during the course of this work.
13. The work plan is to reflect whether each location will be worked on simultaneously or sequentially.
14. Identify if the Authority will require any equipment to perform the final inspection. If so, identify this in the work plan accordingly.
15. The site-specific work plans are to reflect the selected temporary platform means for every installed location (e.g. scaffolding, suspended platforms, etc.).

804.04 Measurement

Replace this Subsection in its entirety with the following:

**Railroad Reimbursement Costs (No-Bid)** provides a value for reimbursement to the Contractor for costs associated with flagging, track outages, permit, and engineering reviews/inspection costs associated with maintenance and protection of railroad traffic. The only reimbursable costs permitted will be those charges approved by the Engineer for the impacted railroad companies flagging, track outages, permit, and engineering reviews/inspection related to maintenance and protection of railroad traffic affected by this Contract.

804.05 Payment

Replace this Subsection in its entirety with the following:

Payment will be made under:

***PAY ITEM PAY UNIT***

Railroad Reimbursement Costs (No-Bid) USD

No separate payment will be made for attending railroad sponsored training, but the costs thereof will be included in the unit prices bid for the various pay items in the Contract.

No separate payment will be made to account for Contractor overtime costs as a result of night or weekend work necessary due to railroad constraints.

Division 900 - Materials

Section 902 – Aggregates

902.05 Coarse Aggregate

Delete the last paragraph of Part (B).

Replace the first paragraph of Part (F) with the following:

(F) Lightweight aggregate manufactured from dredged sediment required or allowed to be used as structural fill shall be a rotary kiln material meeting the requirements of ASTM C330.

NOTE TO DESIGNER: Include the following if Warm Mix Asphalt is being used in lieu of Hot Mix Asphalt.

Rename the following Section with the following:

Section 903 – Warm Mix Asphalt(WMA)

903.01 Composition

Nominal maximum size of aggregates and asphalt binder for mixes shall be as follows:

|  |  |  |
| --- | --- | --- |
|  | **Asphalt Binder** | **Aggregate Size** |
| Base Course | PG 64-22 | 1” (25.0 mm) |
| Intermediate Course\* | PG 64-22 | ¾” (19.0 mm) |
| Surface Course | PG 64-22 | ½” (12.5 mm) |
| Surface Course | PG 76-22 | ½” (12.5 mm) |

\*Where permitted by the Contract Documents the nominal aggregate size for intermediate courses may be adjusted to ¾”, ½” or 3/8” mixes as necessary to accommodate the lift thickness of material to be placed. Lift thickness shall be no less than three (3) times the nominal maximum aggregate size unless otherwise permitted by the Engineer.

903.04 Tables

Add the following:

All other asphalt binder shall conform to AASHTO M 320, Table 1. A written certification of compliance shall be furnished for the asphalt cement and shall be submitted in accordance with Subsection 105.04.

Delete the last row from Table 903-2.

Delete the last row from Table 903-3.

Delete the last row from Table 903-4.

Delete Mix Compaction Level “H” from last row in Table 903-5.

Delete Mix Compaction Level “H” from last row in Table 903-6.

Section 904 - Bituminous Material

Delete Subsection 904.02 in its entirety and replace with the following:

904.02 Trackless Tack Coat

Trackless Tack Coat shall be as listed in QPL, or an approved equal shall conform to the following physical properties:

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Test Method** | **Min.** | **Max.** |
| Saybolt Furol Viscosity, SFS @ 25º C | ASTM D88 | 15 | 100 |
| Storage Stability, 24 hrs., % | ASTM D244 | - | 1 |
| Storage Stability, 5 days, % | ASTM D244 | - | 5 |
| Residue by Distillation, % | ASTM D244 | 50 | - |
| Oil Distillate, % | ASTM D244 | - | 1 |
| Sieve Test, % | ASTM D244 | - | 0.3 |
| Test on Residue | - | - | - |
| Penetration, @ 25º C | ASTM D5 | - | 20 |
| Softening Point Range Deg. C | ASTM D36 | 65 | - |
| Solubility, % | ASTM D2042 | 97.5 | - |
| Original Binder DSR @ 82º C | - | - | - |
| G\*/SIN δ, 10 rad./sec. | AASHTO T111 | 1 | - |
| Product should not contain filler such as clay, etc. | - | - | - |
| Keep from Freezing | - | - | - |

904.06 Sealing Materials

1. Hot Poured Joint Sealant

Replace the entire paragraph with the following:

Hot poured joint sealers shall be from the QPL and shall conform to the requirements of ASTM Designation D6690 for joints in concrete and asphalt pavements.

Add the following Subsection:

904.10 Inverted Emulsified Asphalts

Inverted emulsified asphalt of the medium curing (IEMC) type shall be prepared using a suitable grade of medium curing cut-back asphalt conforming to Subsection 904.04, with the necessary water and emulsifier required. The inverted asphalt emulsion shall not be mixable with water in any proportion, shall remain homogeneous after 15 hours at 0 **º**F, and shall conform to the following:

| Table 904-1 IEMC Table | | |
| --- | --- | --- |
| Criterion | IEMC-250 | IEMC-800 |
| Kinematic viscosity at 140 ºF (60 ºC), centistokes | 250-500 | 800-1200 |
| Settlement, 7 days, % maximum | 1 | 1 |
| Distillation, by weight: |  |  |
| Asphalt content, % minimum | 65 | 67 |
| Water, % | 3-12 | 3-12 |
| Solvent (by difference), % minimum | 15 | 12 |
| Residue from distillation, Absolute viscosity at 140 ºF (60 ºC), poises | 300-1200 | 30-120 |
| Ductility at 77 ºF (25 ºC), cm min | 100 | 100 |
| Solubility in trichloroethylene by weight, % minimum | 98 | 98 |

Inverted emulsified asphalts shall contain no more than eight percent VOS, by volume, and shall be used for mixed-in-place construction. Other limitation requirements and the use and storage of inverted emulsified asphalts shall conform to Subsection 904.04.

Add the following:

904.11 Polymerized Joint Adhesive

For longitudinal cold joints in HMA paving, use polymerized joint adhesive that is a hot applied joint adhesive that conforms to the requirements in Table 904.11-1:

|  |  |  |
| --- | --- | --- |
| **Table 904.11-1 Requirements for Polymerized Joint Adhesive** | | |
| **Property** | **Test Method** | **Requirement** |
| Cone Penetration, 25° C | ASTM D 5329 | 60 - 100 |
| Flow, 60° C | ASTM D 5329 | 5 mm maximum |
| Resilience, 25° C | ASTM D 5329 | 30% minimum |
| Ductility, 4° C | ASTM D 113 | 30 cm minimum |
| Tensile Adhesion, 25° C | ASTM D 5329 | 500% minimum |
| Softening Point | ASTM D 36 | 77° C minimum |
| Asphalt Compatibility | ASTM D 5329 | Pass |

The Contractor shall ensure that the polymerized joint adhesive has a viscosity at the recommended pour temperature to allow for proper application of the material. The Contractor shall obtain documentation of recommended pour temperature and safe heating temperature for the material from the manufacturer. The Contractor shall submit certification of compliance, as specified in 105.04, for polymerized joint adhesive. Attach test results to the certification.

Material for surface sealing transverse joints in the new HMA pavement shall be asphalt cement Viscosity Grade AC-20.

Hot poured joint sealant to be placed at bridge abutment structures and HMA/PCCP interfaces at toll plazas shall be as listed in QPL, or an approved equal.

[Include the following if necessary:]

Section 905 – Concrete, Mortar and Grout

905.09 Lightweight Concrete

1. Manufactured Lightweight Aggregate Concrete
2. Aggregate

Delete the second line of the first paragraph and replace with:

The aggregate shall conform to ASTM C330.

905.10 Grout

Add the following language after the end of the last paragraph:

Grout shall conform to ASTM C476.

905.11 Mortar

Delete the entire paragraph and replace with:

Mortar shall conform to ASTM C270. Use Type N, S or M mortar as per Project requirements.

The following Subsection heading is renamed:

905.12 Non-Shrink, High-Strength Mortar, Paved Concrete Decks

Delete this Subsection and replace it with the following:

The material shall conform to ASTM C928 R3. The material shall be pre-packaged and ready for mixing just prior to use in accordance with manufacturer instructions.

905.13 Non-Metallic, Non-Shrink Mortar or Grout

Delete this Subsection and replace it with the following:

The material shall conform to ASTM C1107 and have a minimum set time of 60 minutes when tested in accordance with ASTM C191. Use shall be in accordance with manufacturer instructions.

The following Subsection heading is renamed:

905.14 Non-Shrink, High-Strength Mortar, Bare Concrete Decks

Delete this Subsection and replace it with the following:

The material shall conform to ASTM C928 R3. The material shall be pre-packaged and ready for mixing just prior to use in accordance with manufacturer instructions. The material shall have a minimum bond strength of 2,000 psi in 24 hours as per ASTM C882, and a relative dynamic modulus (RDM) of 90% after 300 cycles as per ASTM C666.

905.15 Non-Shrink, High Early Strength Mortar

Delete this Subsection and replace it with the following:

Products submitted under this product type shall have AASHTO Product Evaluation and Audit Solutions test data in accordance with the submission cycles stated in AASHTO’s Rapid Hardening Concrete Patching (RHCP) technical committee work plan.

The material shall conform to ASTM C928. The material shall be pre-packaged and be ready for mixing immediately prior to use in accordance with manufacturer instructions.

905.16 Elastomeric Concrete

Delete the third paragraph and replace it with the following:

The material shall conform to the following requirements:

|  |  |  |
| --- | --- | --- |
| Test Requirement | Procedure | Minimum Requirements |
| Resilience | ASTM C579-01 | 70% |
| 5-hour compressive strength | ASTM C579-01 (modified) | 500 psi |
| 24-hour compressive strength | ASTM C579-01 (modified) | 2000 psi |
| 7-day Tensile | ASTM D638 | 150 psi |
| 7-day Tear | ASTM D624 | 40 lbf/in |
| Pot Life | As per Engineer’s direction | 5 minutes |

905.18 Epoxy Bonding Coat

Delete this Subsection and replace it with the following:

Products submitted under this product type shall have AASHTO Product Evaluation and Audit Solutions test data in accordance with the submission cycles stated in AASHTO’s Epoxy Resin Bonding (ERB) technical committee work plan.

Epoxy bonding coat shall be a two-component, epoxy-resin, bonding system for application to Portland cement concrete. The coating shall conform to ASTM C881. The system type, grade, and class shall depend on the condition of intended use. Color shall be clear or gray to match the color of the adjacent concrete.

905.20 Epoxy Injection Systems

Delete the first paragraph and replace with:

Epoxy injection systems shall have the following features:

1. Separate feed lines to the mixing chamber
2. Automatic mixing and metering pump
3. Ability to thoroughly mix the epoxy components in the mixing chamber
4. Operator control of the epoxy flow from the mixing chamber
5. Clean, legible, accurate pressure gauges easily viewable by the operator
6. Ability to provide an uninterrupted pressure head to continually force epoxy into the cracks
7. Injection pressure from 0 to at least 200 PSI
8. Capable of metering each epoxy component to within 3.0% of the epoxy manufacturer's mix ratio

[Include the following with Contracts that include concrete:]

The following is Subsection added:

905.21 Quality Acceptance Limits for Portland Cement Concrete

This Subsection specifies the requirements for the evaluation of Portland Cement Concrete items through quality acceptance testing. The Specifications, herein, establish standards for Portland Cement concrete construction to achieve the quality acceptance limits for applicable performance parameters and their respective Percent Within Limit (PWL) measurements.

1. Quality Acceptance Limits

Portland Cement concrete mixes, specified in Section 905, shall be developed to meet the following performance criteria Quality Acceptance Limits in accordance with the application properties specified in Paragraph 905.23(B), Table 905.2 unless otherwise noted on the Contract Drawings.

1. Compressive Strength (ASTM C 39)

The Lower Quality Limit (LQL) shall be the minimum compressive strength (psi, at 28 days) for the various Classes of concrete as provided in the Table under Paragraph 905.05(A) plus 300 psi. The minimum compressive strength (psi, at 28 days) used in determining the Lower Quality Limit (LQL) for concrete overlays of the various types shall be in accordance with the design strengths provided in the applicable Subsections within Section 905 of these Specifications plus 300 psi.

Flexural Strength (ASTM C 78)

The Lower Quality Limit (LQL) shall be 700 psi.

Permeability

(a) AASHTO T277 – The Upper Quality Limit (UQL) shall be 2,000 Coulomb resistivity for LMC overlays and 1,100 Coulomb for HPC.

(b) AASHTO T259/T260 – The chloride permeability shall be correlated in accordance with the following table:

|  |  |  |  |
| --- | --- | --- | --- |
| Chloride permeability | Charge passed (coulombs) | Type of Concrete | Total integral chloride to 1.6 in. depth after 90 day ponding test |
| High | > 4000 | High water-cement ratio, conventional (> 0.6) PCC\* | > 1.3 |
| Moderate | 2000-4000 | Moderate water-cement ratio, conventional (0.4 to 0.5) PCC\* | 0.8 to 1.3 |
| Low | 1000-2000 | Low water-cement ratio, conventional (< 0.4) PCC\* including LMC | 0.55 to 0.8 |
| Very Low | 100-1000 | Latex-modified concrete Internally sealed concrete | 0.35 to 0.55 |
| Negligible | < 100 | Polymer impregnated concrete Polymer concrete | < 0.35 |

\* Portland cement concrete.

Bond Strength [ACI 503R-93 – Appendix A (Modified)]

The Lower Quality Limit (LQL) shall be 150 psi.

Water to Cement Ratio (AASHTO T 318)

The Upper Quality Limit (UQL) shall be the maximum water to cement ratio (lb./lb.) for the various classes of concrete as provided in the Table under Paragraph 905.05(A). The Upper Quality Limit (UQL) for concrete overlays of the various types shall be in accordance with the water to cement ratios provided in the applicable Subsections within Section 905 of these Specifications.

Air Content (ASTM C 138, ASTM C 173 or ASTM C 231)

Both the Upper Quality Limit (UQL) and the Lower Quality Limit (LQL) for air content shall be the percentage value [plus/minus tolerance] provided in the Table under Paragraph 905.05(A) for the various sizes of Coarse Aggregate. The Upper Quality Limit (UQL) for concrete overlays of the various types shall be in accordance with the air content provided in the applicable Subsections within Section 905 of these Specifications. Air content test values outside the ranges specified, herein, shall be subject to rejection or retest in accordance with Subsection 401.06.

Chloride Ion Concentration by Weight of Cementitious Material (AASHTO T 260, ASTM C 1152, ASTM C 1218, ASTM C 114, ACI 222R)

The acid soluble chloride ions by weight of cementitious material in the concrete mix shall be less than, or equal to, 0.10% for reinforced concrete, as per ACI 222R. The water soluble chloride ions by weight of cementitious material in the concrete mix shall be less than, or equal to, 0.08% for reinforced concrete, as per ACI 222R.

Add the following Subsection:

905.22 Quality Acceptance Testing, Sampling, and Inspection for Portland Cement Concrete

Quality acceptance testing during placing of concrete will be performed on samples taken from the end of the pump line or at the point of discharge in accordance with ASTM C 172. The Engineer will take samples of concrete from each Lot during a single Work period (day’s placement quantity) based on random sampling procedures contained in ASTM D 3665. A Lot of concrete is defined in Table 905.1, Lots and Sublots. For each Sublot, a minimum of six cylinders will be made in accordance with ASTM C 31 when testing compressive strength, as well as a minimum two 4” by 8” cylinders when permeability is being tested, and a minimum of three beams when flexural strength is being tested. The cylinders and beams will be tested in accordance with ASTM C 39 and ASTM C 78 respectively, for each Sublot to determine the compressive strength and flexural strength at the time requirements specified. Refer to Subsection 401.16 of these Specifications for additional test cylinders required for early day (3-day, 7-day) compressive strength testing and initial permeability testing (28-day).

|  |  |  |
| --- | --- | --- |
| TABLE 905.1 LOTS AND SUBLOTS | | |
| Day’s Placement Quantity  (Cubic Yards) | Number of Lots | Number of Sublots |
| Less than 50 | Note 1 | Notes 1 and 4 |
| 50 -100 | 1 | 3 equally divided |
| 101- 400 | 1 | Note 2 |
| Greater than 400 | Note 3 | Notes 2 and 3 |

Table 905.1 Notes:

1. If a given Class of concrete has one Work period’s placement less than 50 cubic yards, it will not constitute a Lot. It will be added either to the previous, or to the next Work period’s Lot, whichever is closer in actual time, or until a minimum of 3 Sublots are completed constituting a Lot.
2. The total number of Sublots per Lot will be equal to the number of Sublots of 50 cubic yards each, plus one Sublot that makes up the balance.
3. Each 400 cubic yards placed will constitute a Lot consisting of eight 50 cubic yard Sublots. If after dividing up a given Work period’s placement, there is a remainder of 3 to 7 Sublots, these Sublots will constitute a Lot. If the remainder is 2 Sublots, these will be added to 8 Sublots in the preceding Lot, and be divided into 2 equal Lots. If the remainder is 1 Sublot, it will be added to 8 Sublots in the preceding Lot, and will be divided into 2 Lots, with the first 5 Sublots constituting a Lot, and the last 4 Sublots (including the remaining 1 Sublot) constituting a Lot.
4. If the total concrete quantity under the Contract for any type of mix is greater than 20 cubic yards and less than 50 cubic yards, it will constitute 1 Lot and will be divided into a minimum of 3 Sublots, regardless of the placement schedule. If the total concrete quantity under the Contract for any type of mix is less than or equal to 20 cubic yards, the material will not be subject to quality acceptance testing (except for air and slump tests) unless directed by the Engineer.
5. For concrete placements where flexural strength is being tested, a Sublot shall be deemed to be one fourth of a Lot of concrete, or 150 cubic yards of concrete, whichever is less. A Lot is defined as the production of a single Work period.
6. The number of Sublots shown in the table, including the requirements in Notes (1) thru (4), may be modified by the Engineer.

For LMC and silica fume overlay placements, a Sublot shall be deemed to be one truck load of concrete. A Lot is defined as the production of a single Work period.

1. Quality Assurance Testing Standards and Frequency of Testing

Some or all of the following procedures will be used by the Engineer to evaluate the quality of in-place concrete:

1. Compressive Strength

In accordance with ASTM C 31 and ACI 318‑99 ‑ Part 3, Chapter 5, Item 5.6, entitled "Evaluation and Acceptance of Concrete", except that samples will be obtained on a random basis with a minimum of six cylinders prepared for each sublot. For LMC and Silica Fume Concrete Overlays, a minimum of six test cylinders for compressive strength testing will be made for each truck load (sublot). The test cylinder size will be 4” by 8” or 6” by 12” with plastic molds and the samples will be made in accordance with ASTM C 31, except submersion in water storage containers shall be used in lieu of moist room curing if when required by the Engineer for hot weather concreting of Portland cement concrete, and LMC and silica fume concrete will be air cured once demolded. The Engineer will calculate the average of 2 test specimens at the design compressive strength time requirement (28 days). The average of the two test specimen result values for each sublot shall be considered the sublot compressive strength value.

Flexural Strength

From each sublot sample, three test beams shall be made in accordance with ASTM C 31. The beams will be 4” x 4” x 14” or 6” x 6” x 20”. The beams shall be tested in accordance with ASTM C 78. The Engineer will calculate the average of 2 test specimens at the design flexural strength time requirement (28 days). The average of the two test specimen result values for each sublot will be considered the sublot flexural strength value.

Coulomb Test

To evaluate the permeability of the concrete. For each Sublot, the Engineer will cast two 4” by 8” cylinder specimens. A sublot for LMC and silica fume concrete is defined as a truck load. Two-inch thick samples will be cut from the center of each cylinder for testing, with a maximum of two slices per cylinder utilized. LMC and silica fume overlay samples shall be wet cured in water storage containers per ASTM C31 for 2 days, and air cured at the site for 3 days, prior to pick up for testing. Cylinders of Portland cement concrete will generally be tested for 28 day permeability. The two cylinders for LMC overlays will be tested for 56 day permeability, and at 90 day permeability for silica fume concrete overlays in accordance with AASHTO T 277. The results of the AASHTO T 277 testing shall be correlated with the results of a 90 day ponding test that shall be performed in accordance with AASHTO T 259. The completed results of the 90 day ponding test shall also be included in the test results. The average of the two test specimen result values for each Sublot will be considered the Sublot Coulomb test value.

For each HPC and LMC Sublot, the Engineer will cast four (4) 4” x 8” cylinder specimens for permeability testing in accordance with AASHTO T277 and two (2) 6” x 6” x 3” thick samples for permeability testing in accordance with AASHTO T259/T260. The 4” x 8” cylinders shall be tested at 28 day (two cylinders) for LMC only and at 56 day (two cylinders) intervals for LMC and HPC in accordance with AASHTO T277. The 6” x 6” x 3” thick samples for 90 day ponding testing will be tested in accordance with AASHTO T259/T260. The average of the two (2) test specimen result values for each Sublot will be considered the Sublot Coulomb test value.

Bond Strength

To evaluate the bond strength between the overlay concrete and the parent concrete at 28 days in accordance with ACI 503R-93 – Appendix A (Modified). For each Sublot, the Engineer will perform 3 tests. Three 4-inch diameter cores will be cut 1-inch into the parent concrete to isolate the overlay concrete. The average of the three test result values for the Sublot will be considered the Sublot bond strength test value. The locations for each test will be randomly determined.

Water to Cement Ratio Test

Tested during the placement using a Microwave Drying Oven, in accordance with AASHTO T 318. Drying times may be adjusted dependent on the mix constituents to provide a constant dry weight. When any test result exceeds the Upper Quality Limit (UQL) of the mix design water to cement ratio, a second test of that load will be performed, and the average of the two will be considered the Sublot water to cement ratio test value. When the maximum aggregate size exceeds 1½ inches, a sample of approximately 5000 grams will be obtained. This sample will be split. Two separate analyses will be performed. The weighted average of the two separate analyses will be considered the Sublot water to cement ratio value.

Air Content Test

Performed during the placement in accordance with ASTM C 138, ASTM C 173 or ASTM C 231. The Engineer will perform one test for each Sublot, which will be considered the Sublot air content test value. Refer to Subsection 401.06 for additional testing requirements for concrete containing fly ash.

Chloride Ion Concentration by Weight of Cement

The Engineer may perform testing for both the acid soluble and water soluble chloride ion concentrations by weight of cementitious material, which shall be evaluated as follows. Powder samples from 28 day concrete cylinders, prepared in accordance with ASTM C 31, shall be tested to assess both the acid soluble and water soluble chloride ion concentrations by weight of cementitious material from the concrete mix produced at the construction site. Samples will be obtained using a rotary hammer drill from the mid-height of a minimum of two Sublot specimens from each Lot. The sample shall be obtained from the inner 3 inches of the cylinder specimen, and shall be a minimum of 40 grams in weight. The acid soluble and water soluble chloride ion concentrations by weight of cementitious material shall be determined at the Authority’s designated Laboratory in accordance with preparatory standards ASTM C 1152 and ASTM C 1218, respectively, followed by ASTM C 114 (silver nitrate titration) for both the acid soluble and water soluble chloride ion analysis.

1. References

The following is a listing of the publications, standards and codes referenced in this Section, of which the latest edition shall govern:

1. American Association of State Highway and Transportation Officials (AASHTO) Standard Specifications for Highway Bridges

T 259 Resistance of Concrete to Chloride Ion Penetration.

T 260 Standard Method of Test for Sampling and Testing for Total Chloride Ion in Concrete and Concrete Raw Materials – Silver Nitrate Titration

T 277 Electrical Indication of Concrete's Ability to Resist Chloride

American Concrete Institute (ACI)

222R Corrosion of Metals in Concrete

318 Building Code Requirements for Reinforced Concrete

503R-93 Appendix A (Modified): Use of Epoxy Compounds with Concrete

American Society for Testing and Materials (ASTM)

C 31 Practice for Making and Curing Concrete Test Specimen in the Field

C 39 Test Method for Compressive Strength of Cylindrical Concrete Specimens

C 78 Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)

C 114 Test Methods for Chemical Analysis of Hydraulic Cement

C 138 Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete

C 172 Practice for Sampling Freshly Mixed Concrete

C 173 Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method

C 231 Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method

C 1152 Test Method for Acid-Soluble Chloride in Mortar and Concrete

C 1218 Test Method for Water-Soluble Chloride in Mortar and Concrete

D 3665 Practice for Random Sampling of Construction Materials

Add the following Subsection:

905.23 Acceptance and Rejection of Portland Cement Concrete

1. General

Unless otherwise shown on the Contract Drawings, acceptance of material shall be based on the method of estimating Percentage of Lot Within Specification Limits (PWL), where the PWL will be determined in accordance with this Subsection. All Sublot test result values for a Lot, as defined in Subsection 905.22 (Table 905.1), will be analyzed statistically to determine the total estimated Percent of the Lot that is Within specification Limits, as shown in Paragraph 905.23(B). The PWL is computed using the Lot sample Average value, **X**, as defined in Subparagraph 905.23(C)(3), the Lot sample standard deviation, SN, as defined in Subparagraph 905.23(C)(4), for the specified number of Sublots, n, and the specification Quality Acceptance Limits, as defined in Paragraph 905.21(A), where LQL represents the Lower Quality Limit, and UQL represents the Upper Quality Limit, as they apply to each particular acceptance parameter. From these values, the respective Quality Index (ices), QL for Lower Quality Index and/or QU for Upper Quality, is computed in accordance with Subparagraphs 905.23(C)(5) and 905.23(C)(6). Then the PWL for the Lot for the specified number of Sublots, n is determined from Table 905.4, “Percent of Lot Within Limits (PWL) (Standard Deviation Method)”. Each Lot is then calculated using the formulas specified in Paragraph 905.23(D) and evaluated for acceptance or rejection.

1. Performance Criteria Parameters

Dependent on the designated category, concrete shall be tested for the properties shown below. The PWL of each Lot for each parameter will be determined as specified in Paragraph 905.23(C). Evaluation shall be based on the concrete application for a Lot, and the criteria defined below:

|  |  |
| --- | --- |
| Performance Parameters | Minimum PWL |
| Compressive Strength | 90 |
| Flexural Strength | 90 |
| Permeability | 90 |
| Bond Strength | 80 |
| Water to Cement Ratio | 80 |
| Air Content | 70 |
| Chloride Content | 100\*\* |

The following applies to HPC only:

|  |  |
| --- | --- |
| Performance Parameters | Minimum PWL |
| Compressive Strength | 90 |
| Permeability | 90 |
| Air Content | 70 |

The following applies to LMC only:

|  |  |
| --- | --- |
| Performance Parameters | Minimum PWL |
| Compressive Strength | 90 |
| Permeability | 90 |
| Bond Strength | 80 |
| Water to Cement Ratio | 80 |
| Air Content | 70 |

\*\* Denotes that the chloride content (acid soluble and water soluble) will only be analyzed for the average of test results for any given Lot of concrete, as per Subparagraph 905.22(A)(7), and Parts 905.23(E)(1)(b) and 905.23(E)(1)(c).

Table 905.2 defines the Quality Acceptance performance criteria to be evaluated for Acceptance or Rejection for a given concrete application. The Category/application shall be determined by the Designer and stipulated on the Contract Drawings. In addition, all concrete shall conform to the requirements of Paragraph 905.23(E). Any deficiencies found to exist as specified in Paragraph 905.23(E) shall govern, and the Contractor shall remove and replace the concrete in that particular Lot at no cost to the Authority:

| TABLE 905.2 PERFORMANCE CRITERIA PARAMETERS | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| Category/  Application | Water/Cement  Ratio (W/C) | % Air | Permeability | Bond  Strength | Compressive  Strength | Flexural  Strength |
| Category I Full Depth Pavements and Unbonded Pavement Overlays | | | | | | |
|  | P | P | --- | --- | --- | P |
| LQL: | --- | \* | --- | --- | --- | 700 psi |
| UQL: | \* | \* | --- | --- | --- | --- |
| Category II Bonded Pavement Overlays | | | | | | |
|  | P | P | --- | P | P | --- |
| LQL: | --- | \* | --- | 150 psi | \* | --- |
| UQL: | 0.40 | \* | --- | --- | --- | --- |
| Category III Elevated Structural Overlays | | | | | | |
|  | P | P | P | P | P | --- |
| LQL: | --- | \* | --- | 150 psi | \* | --- |
| UQL: | 0.40 | \* | 2,000 | --- | --- | --- |
| Category IV Structural (Exposed to freeze-thaw cycles and/or sulfates chlorides or marine environment) | | | | | | |
|  | P | P | P | --- | P | --- |
| LQL: | --- | \* | --- | --- | \* | --- |
| UQL: | \* | \* | 1,100 | --- | --- | --- |
| Category V Structural (Exposed to freeze-thaw cycles and/or sulfates only. No exposure to chlorides or marine environment) | | | | | | |
|  | P | P | --- | --- | P | --- |
| LQL: | --- | \* | --- | --- | \* | --- |
| UQL: | \* | \* | --- | --- | --- | --- |
| Category VI Structural (Not exposed to freeze-thaw cycles) and Miscellaneous Applications (at-grade sidewalks, at-grade curbs, kerfs, foundations, footings, drainage structures, manholes, pipe pile fill, and all concrete applications below grade) | | | | | | |
|  | --- | --- | --- | --- | P | --- |
| LQL: | --- | --- | --- | --- | \* | --- |
| UQL: | --- | --- | --- | --- | --- | --- |

Table 905.2 Notes:

1. “\*” - Refer to applicable Subsections within Section 905 for the various types of concrete. For compressive strength, refer to Subparagraph 905.21(A)(1).
2. “---“ – Parameter not required for establishing acceptance or rejection for a given concrete application.
3. “P” - Performance criteria parameter for a given concrete application under each Category subject to acceptance or rejection.
4. Method of Estimating Percentage of Material Within Limits (PWL)
5. Samples shall be taken from the Lot by use of random sampling procedures specified in Subsection 905.22.
6. Make the test specimens on the test sample in accordance with Subsection 905.22.
7. Determine the Lot sample Average value, **X**, by calculating the average of all Sublot test values.
8. Find the Lot sample standard deviation, SN, by using the following formula:

SN = [(d12 + d22 + d32 + … + dn2) / n-1]1/2

Where:

SN = standard deviation of the Sublot test values

d1, d2, d3, dn… = deviation of the individual Sublot test values

X1, X2, X3, Xn … from the Average value, **X**, that is,

d1 = (X1 – **X)**, d2 = (X2 – **X**), d3 = (X3 - **X**) …, dn = (Xn – **X**)

n = number of Sublots

1. Find the Lower Quality Index, QL, by subtracting the Lower Quality Limit (LQL) from the Average value, **X**, and dividing the result by SN.

QL = (**X** – LQL) / SN

1. Find the Upper Quality Index, QU, by subtracting the Average value, **X**, from the Upper Quality Limit (UQL) and dividing the result by SN.

QU = (UQL – **X**) / SN

1. The percentage of material above lower tolerance limit, PL, and the percentage of material below upper tolerance limit, PU, will be found by entering Table 905.4, “Percent of Lot Within Tolerance Limit (PWL) (Standard Deviation Method)” with QL and/or QU using the column appropriate to the total number of Sublots, n, and reading the number under the column heading “PWL”.
2. For concrete properties with only an Upper Quality Limit (ratio of water to cementitious material, permeability), PWL equals PU. For concrete properties with only a Lower Quality Limit (bond strength, compressive strength, flexural strength), PWL equals PL. For concrete properties with both Upper and Lower Quality Limits (air content), first calculate the Upper Quality Index, QU, and the Lower Quality Index QL, by using the Upper Quality Limit (UQL) and the Lower Quality Limit (LQL) respectively, as stipulated in Subparagraph 905.21(A)(6). Then determine PWL using the following formula:

PWL = (PU + PL) – 100

1. Acceptance Requirements

Acceptance Requirements are calculated as follows:

| TABLE 905.3 QUALITY ACCEPTANCE REQUIREMENTS | |
| --- | --- |
| Percent Within Limits (PWL) | Compressive Strength Result |
| 90 – 100 | Acceptance |
| 75 – 89 | Acceptance – See Note A |
| 55 - 74 | Acceptance – See Note B |
| Percent Within Limits (PWL) | Permeability & Bond Strength Result |
| 80 – 100 | Acceptance |
| 55 – 79 | Acceptance – See Note A |
| Percent Within Limits (PWL) | Flexural Strength Result |
| 90 – 100 | Acceptance |
| 75 – 89 | Acceptance – See Note A |
| 55 – 74 | Acceptance – See Note B |

Note A: The Contractor shall develop a corrective action plan which at a minimum identifies probable causes for the deficient concrete, recommends improvements and implements changes for future concrete placement. The corrective action plan requires approval prior to the Contractor resuming concrete placement operations.

Note B: The Contractor shall comply with the requirements of Note A and for subsequent concrete placement have an ACI Certified Concrete Quality Technical Manager on site during concrete pours and to inspect curing operations daily.

No additional compensation will be made for admixtures of any kind.

1. Correction of Deficiencies

Remove and Replace Concrete

Concrete shall be removed and replaced in a manner approved by the Engineer and at no additional cost to the Authority if any of the following deficiencies exist.

1. Percent Within Limits (PWL) for compressive strength, flexural strength, permeability, or bond strength is below 55.
2. The average acid soluble chloride ions by weight of cementitious material test results for any given Lot of concrete exceed the limit of 0.10% weight of chloride ions by weight of cementitious material, in accordance with ASTM C 1152, ASTM C 114, and ACI 222R.
3. The average water soluble chloride ions by weight of cementitious material test results for any given Lot of concrete exceed the limit of 0.08% weight of chloride ions by weight of cementitious material, in accordance with ASTM C 1218, ASTM C 114, and ACI 222R.
4. For all concrete applications, the cylinder compressive strength shall conform with the following:
5. All strength test results shall equal or exceed the minimum compressive strength specified in 905.05(A) or as required by the Supplemental Specifications. The strength of no individual cylinder shall be less than 85 percent of the minimum specified compressive strength.
6. For high early strength special mix designs, the strength of individual cylinders shall be no less than 100 percent of the minimum specified compressive strength that is required to be reached within the time frame for subjecting the concrete to traffic loading.
7. If either, or both of the requirements specified in Subparts 905.23(E)(1)(d)(1) and 905.23(E)(1)(d)(2) are not met, the in-place compressive strength shall be investigated in accordance with ACI 318-99, Section 5.6.5, at no additional cost to the Authority. If the compressive strength test results of the in-place concrete fail to meet either, or both of the requirements specified in Subparts 905.23(E)(1)(d)(1) and 905.23(E)(1)(d)(2), the concrete shall be considered deficient, and Subparagraph 905.23(E)(1) shall apply.
8. Concrete slabs, wearing surfaces or structures that exhibit any cracks prior to opening to vehicular operations or loading shall be subject to the actions specified in Subparagraph 905.23(E)(1). If the concrete is accepted by the Engineer, cracks in overlays shall be sealed in accordance with Paragraph 401.18(I), and cracks in concrete structures shall be sealed in accordance with Subsection 418.05. Cracks in concrete structures shall be sealed in a manner approved by the Engineer. Cracks in concrete pavement shall be addressed in accordance with Paragraph 304.04(Q). Cracks shall be sealed in a manner approved by the Engineer, and at no cost to the Authority.
9. Delamination Testing – All concrete overlays shall be checked by the Engineer using the chain drag method in accordance with ASTM 4580-86 no sooner than 24 hours and no greater than 30 days after the completion of Work. Unsound areas will be defined. If any delaminations are identified, the Contractor shall remove the areas evidencing delamination between the fresh concrete overlay and the existing concrete. These areas shall be replaced at no cost to the Authority. The determination by the Engineer as to the existence of delaminations shall be final and binding. The repaired areas shall be subject to retesting.

| TABLE 905.4 PERCENT OF LOT WITHIN TOLERANCE LIMIT (PWL) (STANDARD DEVIATION METHOD)  Positive Values of Quality Index (QI) (n = Number of Sublots in the Lot) | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| PWL | n=3 | n=4 | n=5 | n=6 | n=7 | n=8 |
| 99 | 1.1541 | 1.4700 | 1.6714 | 1.8008 | 1.8888 | 1.9520 |
| 98 | 1.1524 | 1.4400 | 1.6016 | 1.6982 | 1.7612 | 1.8053 |
| 97 | 1.1496 | 1.4100 | 1.5427 | 1.6181 | 1.6661 | 1.6993 |
| 96 | 1.1456 | 1.3800 | 1.4897 | 1.5497 | 1.5871 | 1.6127 |
| 95 | 1.1405 | 1.3500 | 1.4407 | 1.4887 | 1.5181 | 1.5381 |
| 94 | 1.1342 | 1.3200 | 1.3946 | 1.4329 | 1.4561 | 1.4716 |
| 93 | 1.1269 | 1.2900 | 1.3508 | 1.3810 | 1.3991 | 1.4112 |
| 92 | 1.1184 | 1.2600 | 1.3088 | 1.3323 | 1.3461 | 1.3554 |
| 91 | 1.1089 | 1.2300 | 1.2683 | 1.2860 | 1.2964 | 1.3032 |
| 90 | 1.0982 | 1.2000 | 1.2290 | 1.2419 | 1.2492 | 1.2541 |
| 89 | 1.0864 | 1.1700 | 1.1909 | 1.1995 | 1.2043 | 1.2075 |
| 88 | 1.0736 | 1.1400 | 1.1537 | 1.1587 | 1.1613 | 1.1630 |
| 87 | 1.0597 | 1.1100 | 1.1173 | 1.1191 | 1.1199 | 1.1204 |
| 86 | 1.0448 | 1.0800 | 1.0817 | 1.0808 | 1.0800 | 1.0794 |
| 85 | 1.0288 | 1.0500 | 1.0467 | 1.0435 | 1.0413 | 1.0399 |
| 84 | 1.0119 | 1.0200 | 1.0124 | 1.0071 | 1.0037 | 1.0015 |
| 83 | 0.9939 | 0.9900 | 0.9785 | 0.9715 | 0.9672 | 0.9643 |
| 82 | 0.9749 | 0.9600 | 0.9452 | 0.9367 | 0.9325 | 0.9281 |
| 81 | 0.9550 | 0.9300 | 0.9123 | 0.9025 | 0.8966 | 0.8928 |
| 80 | 0.9342 | 0.9000 | 0.8799 | 0.8690 | 0.8625 | 0.8583 |
| 79 | 0.9124 | 0.8700 | 0.8478 | 0.8360 | 0.8291 | 0.8245 |
| 78 | 0.8897 | 0.8400 | 0.8160 | 0.8036 | 0.7962 | 0.7915 |
| 77 | 0.8662 | 0.8100 | 0.7846 | 0.7716 | 0.7640 | 0.7590 |
| 76 | 0.8417 | 0.7800 | 0.7535 | 0.7401 | 0.7322 | 0.7271 |
| 75 | 0.8165 | 0.7500 | 0.7226 | 0.7089 | 0.7009 | 0.6958 |
| 74 | 0.7904 | 0.7200 | 0.6921 | 0.6781 | 0.6701 | 0.6649 |
| 73 | 0.7636 | 0.6900 | 0.6617 | 0.6477 | 0.6396 | 0.6344 |
| 72 | 0.7360 | 0.6600 | 0.6316 | 0.6176 | 0.6095 | 0.6044 |
| 71 | 0.7077 | 0.6300 | 0.6016 | 0.5878 | 0.5798 | 0.5747 |
| 70 | 0.6787 | 0.6000 | 0.5719 | 0.5583 | 0.5504 | 0.5454 |
| 69 | 0.6490 | 0.5700 | 0.5423 | 0.5290 | 0.5213 | 0.5164 |
| 68 | 0.6187 | 0.5400 | 0.5129 | 0.4999 | 0.4924 | 0.4877 |
| 67 | 0.5878 | 0.5100 | 0.4836 | 0.4710 | 0.4638 | 0.4592 |
| 66 | 0.5563 | 0.4800 | 0.4545 | 0.4424 | 0.4354 | 0.4310 |
| 65 | 0.5242 | 0.4500 | 0.4255 | 0.4139 | 0.4073 | 0.4031 |
| 64 | 0.4916 | 0.4200 | 0.3967 | 0.3856 | 0.3793 | 0.3753 |
| 63 | 0.4586 | 0.3900 | 0.3679 | 0.3575 | 0.3515 | 0.3477 |
| 62 | 0.4251 | 0.3600 | 0.3392 | 0.3295 | 0.3239 | 0.3203 |
| 61 | 0.3911 | 0.3300 | 0.3107 | 0.3016 | 0.2964 | 0.2931 |
| 60 | 0.3568 | 0.3000 | 0.2822 | 0.2738 | 0.2691 | 0.2660 |
| 59 | 0.3222 | 0.2700 | 0.2537 | 0.2461 | 0.2418 | 0.2391 |
| 58 | 0.2872 | 0.2400 | 0.2254 | 0.2186 | 0.2147 | 0.2122 |
| 57 | 0.2519 | 0.2100 | 0.1971 | 0.1911 | 0.1877 | 0.1855 |
| 56 | 0.2164 | 0.1800 | 0.1688 | 0.1636 | 0.1613 | 0.1592 |
| 55 | 0.1806 | 0.1500 | 0.1408 | 0.1363 | 0.1338 | 0.1322 |

The following Subsection(s) are added:

905.24 Mortar Seal and Cure

The material shall be acrylic and shall conform to ASTM C1315.

905.25 Non-shrink, High Early Strength Mortar Suitable for Vertical and Overhead Repairs

Products submitted under this product type shall have AASHTO Product Evaluation and Audit Solutions test data in accordance with the submission cycles stated in AASHTO’s Rapid Hardening Concrete Patching (RHCP) technical committee work plan.

The material shall conform to ASTM C928. The material shall have a minimum bond strength of 1500 psi as per ASTM C882 and a minimum relative dynamic modulus of 90% as per ASTM C666.

905.26 Elastomeric Asphaltic Plug Joint System

Elastomeric asphaltic plug joint systems shall be from the QPL.

905.27 Elastomeric Asphaltic Plug Joint, Elastic Joint Sealer

Elastic joint sealers for open joints in barrier curbs, parapets and sidewalks adjacent to asphaltic plug joints shall be from the QPL.

Elastic joint sealers must be compatible with the asphaltic plug joints, bond to asphaltic plug joints, and be capable of accommodating thermal movements of two (2) inches between temperatures of 120 degrees F and -30 degrees F.

905.28 Bag Mixes for Concrete Repairs

The product shall satisfy all safety requirements including exclusion of volatile organic compounds (VOC) and all hazardous materials. It must be possible to mix, place and finish bag mixes using standard equipment. Portland cement used for bag mixes shall conform to ASTM C150, and if coarse aggregates are added they shall be graded as per ASTM C33 with a maximum size of 3/8 inches.

Bag mixes shall meet the following minimum requirements as shown below.

| **Property** | **7 days** | **28 days** | **Test Method** |
| --- | --- | --- | --- |
| **Compressive Strength (psi)** | **4000** | **5000** | **ASTM C39 or ASTM C109 or ASTM C942** |
| **Modulus of Rupture (Flexural Strength) (psi)** | **600** | **700** | **ASTM C78 or ASTM C293 or ASTM C348** |
| **Minimum Splitting Tensile Strength (psi)** | **500** | **600** | **ASTM C496** |
| **Bond/Tensile Adhesion Strength (psi)** | **1500** | **1750** | **ASTM C882** |
| **Freeze-Thaw Resistance** | **N/A** | **RDM 90% after 300 cycles** | **ASTM C666** |

Section 906 – Concrete Admixtures, Curing Materials, And Film Evaporators

906.07 Curing Materials

Replace Part (F) with the following:

1. Evaporation Retarders

Evaporation retardant shall be a high quality, water-based compound that is specifically designed to form a thin monomolecular film to reduce rapid moisture loss from the concrete surface prior to curing.

Section 907 – Joints

907.02 Joint Sealers

Delete the following paragraph and replace it with the following:

1. Joint Sealer

The material shall be an elastomeric, cold poured type sealer conforming to ASTM C920, Type S or M, Class 50 and shall be Grade P for horizontal joints and Grade NS for vertical joints. The color shall match that of adjacent surfaces.

Delete the following paragraph and replace it with the following:

1. Silicone Joint Seal

The material shall conform to the following requirements:

|  |  |  |
| --- | --- | --- |
| **Test Requirement** | **Procedure** | **Specification ASTM D5893** |
| **Tack Free Time, minutes\*** | **ASTM C679** | **5 Hours + 10 minutes** |
| **Accelerated Weathering** | **ASTM C793** | **Satisfactory** |
| **Flow** | **ASTM C639** | **No Flow** |
| **Modulus of Elongation** | **ASTM D412** | **600% (Minimum)** |
| **Bond, Non-Immersed** | **ASTM D5329** | **Satisfactory** |

\*Tack free time may be less than specified to meet project requirements.

907.03 Preformed Elastomeric Joint Sealer

Add the following:

1. Sealer for Joint Seal Replacement, Type IV

Refer to the QPL.

907.08 Rubber Asphalt Concrete

Delete the first paragraph and replace with:

Rubber asphalt concrete shall consist of aggregate and binder mixed as per manufacturer’s instructions.

1. Binder

Add the following language after the end of the first paragraph:

The material shall conform to ASTM D6114.

Section 908 – Reinforcement Steel

[NOTE TO DESIGNER: Include the following in Contracts that specify the use of field-bent galvanized reinforcement in decks, parapets, median barriers, or other limited-use locations for bridge deck repair, rehabilitation or replacement Contracts. Use of ASTM A1094 reinforcement shall be approved by the Authority prior to inclusion in the Contract Documents:]

908.01 Reinforcement Steel for Structures

The following paragraph is deleted and replaced with:

1. Zinc Coating on Reinforcement Steel

Zinc Coating on Reinforcement Steel shall be performed in accordance with the requirements of Paragraph 909.11(D) and Paragraph 909.11(E).

Section 909 – Structural Steel and Other Ferrous Metals

909.01 Structural Steel

Add the following:

1. Stainless Steel

Stainless Steel for the sliding surface of the TFE expansion bearings shall be 1/16" minimum thickness and shall conform to the requirements of ASTM A240, Type 304. The stainless steel surface shall have a minimum Brinnel hardness of 125 and the surface shall be finished to a roughness height value of 20 micro-inches or finer in accordance with ANSI B46.1.

909.04 Castings and Forgings

1. Iron, Malleable and Ductile Castings.

Add the following language to the end of the first paragraph:

All castings, grates, extension rings, extension frames, and covers for inlets and manholes shall be capable of withstanding HS-25 loading when tested as a complete, assembled unit and conform to the following:

Delete the entire second paragraph and replace it with the following:

Gray iron castings shall conform to AASHTO M306, except that the manufacturer may use gray cast iron conforming to AASHTO M105, Class 30B or Class 35B. Proof loading or test bar testing shall be performed according to AASHTO M306 in the supplier’s yard at a frequency directed by the Engineer.

Delete the entire the third paragraph and replace it with the following:

Ductile iron castings shall conform to the requirements of ASTM A536, Grade 65-45-12 or Grade 80-55-06.

[NOTE TO DESIGNER: Include the following in Contracts that specify the use of field-bent galvanized reinforcement in decks, parapets, median barriers, or other limited-use locations for bridge deck repair, rehabilitation or replacement Contracts. Use of ASTM A1094 reinforcement shall be approved by the Authority prior to inclusion in the Contract Documents:]

**909.11 Zinc Coating on Steel**

The following paragraph is added:

1. Continuous Hot-Dip Galvanizing – Reinforcement

Continuous hot-dip galvanized reinforcement in accordance with ASTM A1094 shall only be used where shown on the Contract Plans.

Section 910 – Timber and Timber Preservatives

[Include for all Contracts with timber supported ground mounted sign structures.]

Add the following Subsection:

910.12 Timber Posts for Ground-Mounted Signs

Timber posts for breakaway ground mounted signs shall be S4S Grade No. 2 Southern Pine, and for non-breakaway ground mounted signs S4S Dense Select Structural Southern Pine in accordance with Southern Pine Inspection Bureau and shall be sound, square-edge, saw-finished, with no heartwood requirements, conforming to AASHTO M168. All timber shall receive preservative treatment conforming to the requirements of AASHTO M133 and AWPA Standard C2 or C14 as specified below.

|  |  |  |  |
| --- | --- | --- | --- |
| Timber  Posts/Usage | AWPA Standards | Wood Species/ Treatment Process Minimum Retention (Lb./Cu Ft) | |
| Southern Pine | |
| Creosote | CCA/Penta |
| Posts sawn on four sides | C2 or C14 | 12 | 0.60 |

Add the following Subsection:

910.13 Fire Retardant Treatment

All plywood designated for use as catch or shielding shall be pressure impregnated with fire retardant treatment and shall have a flame spread rating of 25 or less when tested in accordance with ASTM E-84, “Standard Test Method for Surface Burning Characteristics of Building Materials.” Treatment shall be as per the QPL for approved suppliers.

Section 911 ‑ Non‑Ferrous Metals

Add the following Subsection:

911.07 Bronze Bearing Plates

Bronze bearing plates shall be castings conforming to ASTM B22, Copper Alloy UNS. NO. C91100. Castings shall be free from inclusion of foreign materials, blowholes, and other defects affecting their value for the purpose intended. Contact surfaces shall be finished in the direction of motion in accordance with the requirements of ANSI B46.1 for the roughness height value (in micro-inches) indicated on the Plans.

Surfaces shall be of the self-lubricating type which will require no additional or supplementary lubrication during the entire service life. The surfaces shall be provided with trepanned recesses in an approved uniform geometric and overlapping pattern to give optimum lubricating coverage in the direction of motion. The recesses shall be filled with an approved lubricating compound capable of withstanding existing atmospheric elements and temperatures for dry and submerged service. The lubricating compound shall consist of metals, metallic oxides, graphite, and a lubricating binder, all of which shall have inherent and native lubricating qualities.

The compound shall be compressed into the recesses by hydraulic pressure so as to form dense, non-plastic lubricating inserts. The lubricating area shall comprise not less than 25% of the total area. The friction coefficient of the bearing assembly shall not exceed 0.10. Surfaces shall not be planed or otherwise altered after the lubricating compound has been pressed into the surface. No paint or grease shall be applied to the lubricated surfaces or opposing surfaces. Surfaces opposing the lubricated surfaces shall be coated at assembly with liquid or stick lubricant compatible with the lubricating compound used in the trepanned recesses, furnished by the manufacturer of the self-lubricated bronze plates.

Section 912 – Sign Materials

912.01 Aluminum Sheet Sign Panels and Incidental Hardware

1. **Flat Sheet Sign Face Panels, Backup Plates, Clips, Shims and Spacers**

Replace the first paragraph with the following:

Flat Sheet Sign Face Panels, Backup Plates, Clips, Shims and Spacers shall be fabricated from flat aluminum sheet and plate conforming to the requirements of ASTM B209, Alloy 5052-H38 or 6061-T6.

912.03 U-Channel Post

Delete the Subsection and replace it with the following:

U-Channel post for mounting signs and delineators shall be a steel sign support conforming to ASTM A499, Grade 50 or 60, Manual for Assessing Safety Hardware (MASH) compliant. Installation shall be in accordance with manufacturer's recommendations. For repair or replacement of sign posts that are damaged, components made by other manufacturers shall not be used for replacement parts.

Section 913 - Paints and Coatings

913.04 Pavement Marking

1. Latex Paint

Latex paints shall be as specified herein and shall be suitable for application by spray equipment and shall be capable of receiving and securely holding glass beads when applied by the drop‑on method for producing reflectorized traffic markings on hard surface pavement of all types.

The pigment and vehicle shall be so prepared and blended that the resulting paint shall be uniform in composition and of the required consistency. The paint at the time of use shall comply with all the provisions specified herein.

In addition to the methods of tests and inspection set forth below, the Engineer reserves the right to make any and all additional tests he may deem necessary to determine compliance with these Specifica­tions and the suitability of the paint for its intended use. The Engineer further reserves the right to require the manufacturer of the paint to certify to the use of specific materials and components in the quantities specified herein where such materials or components are not readily identifiable in the finished paint.

All paint furnished must be shipped in strong, substantial containers, plainly marked with the name, weight and volume of the content, together with the color, formula and name and address of the manufacturer.

Latex traffic paint for traffic stripes or traffic markings shall be a white or a yellow ready-mixed pigmented binder that is emulsified in water and capable of anchoring reflective glass beads that are separately applied. In addition, the paint shall not contain any of the materials listed in the EPA Code of Regulations (CFR) 40, Section 261.24, Table 1.

Manufacturers of latex paint shall have produced, to the satisfaction of the Authority, a fast-drying traffic paint that meets the following requirements:

1. Composition.

The exact composition of the latex paint shall be left to the discretion of the manufacturer, provided that the finished product meets the requirements as stipulated hereinafter.

1. Pigment.

The pigment portion shall be a combination of prime and extender pigments as required to produce either a white or yellow traffic paint meeting the color and other requirements of the finished product for white or yellow, as specified elsewhere in this specification.

The prime pigment for white paint shall be titanium dioxide conforming to ASTM D 476, Type IV, with a minimum titanium dioxide content of 94 percent and shall be used at a minimum rate of 1 pound per gallon.

The prime pigment for yellow paint shall be a non-toxic organic pigment yellow, No. 75 or equal pre-approved by the Authority laboratory, with excellent exterior and color permanence. The prime pigment shall also contain a minimum 0.2 pounds per gallon of titanium dioxide conforming to ASTM D 476, Type IV, 94 percent purity.

The percent pigment by weight of the finished product shall not be less than 60 nor more than 62 percent.

1. Vehicle.

The non-volatile vehicle shall not be less than 42 percent by weight, and shall be pre-approved by the Authority Laboratory and meet the dry through (early washout) requirements specified hereinafter.

1. Physical Properties.
2. Color.

The color shall match FED-STD-595B, No. 33538 for yellow, No. 37886 for white, and No. 37038 for black

1. Organic Volatiles.

The volatile organic content (VOC) of the finished paint shall contain less than 2 pounds per gallon of volatile organic matter of total non-volatile paint material as required by NJSA 7:27-23.

1. Volume of Solids.

The finished paint shall not be less than 61 percent solids by volume.

1. Total Solids.

The finished paint shall not be less than 77.5 percent total non-volatiles by weight, when tested according to ASTM D 2369.

1. Weight.

The weight of the finished paint shall be 14 ± 0.2 pounds per gallon for each color.

1. Grind.

The grind shall not be less than 2 Hegman when tested in accordance with ASTM D 1210.

1. Field No-Tracking Time.

The paint shall dry to a no-tracking condition under traffic in 120 seconds maximum when the ambient temperature is 77 ºF, and when applied in a wet film thickness of 15 ± 1 mil, at 140 ºF, and with glass beads at the rates specified in Paragraph 913.04(F) for latex traffic paint.

1. Viscosity.

The consistency of the paint shall be not less than 70 nor more than 95 Krebs Units at 77 ºF, when tested according to ASTM D 562.

1. Flexibility.

The paint shall show no cracking or flaking when tested according to ASTM D 522.

1. Dry Opacity.

The minimum contrast ratio shall be 0.95 when tested according to ASTM D 2805.

1. Daylight Reflectance.

The daylight directional reflectance shall not be less than 85 percent for the white paint and not less than 54 percent for the yellow (relative to magnesium oxide), when tested according to ASTM E 1347.

1. Abrasion Resistance.

The abrasion resistance shall be such that no less than 55 gallons of sand shall be required for removal of the paint film when tested according to ASTM D 968.

1. Dilution Test.

The paint shall be capable of dilution with water at all levels without curdling or precipitation such that the wet paint can be readily cleaned up with only water.

1. Dry Through (Early Washout).

The "dry through" time of a 15-mil wet film placed immediately in a humidity chamber maintained at 72.5 ± 2.5 ºF and 90 ± 5 percent relative humidity shall be less than or equal to the Authority Laboratory reference film when tested according to ASTM D 1640, except that the pressure exerted shall be the minimum needed to maintain contact with the thumb and film.

1. Shelf Life.

All paint furnished shall have a minimum shelf life of nine months at temperatures above 35 ºF. When tested, the paint shall conform to the physical requirements specified herein. In addition, the paint shall show no skinning, gelling or hardening on the surface, nor hard settling upon storage in the sealed containers, that will affect the performance of the product.

1. Packaging.

The paint shall be delivered in containers as recommended by the manufacturer. The containers shall be free of pin holes, scratches, or other defects that may allow contamination of the paint from corrosion of the container.

Each container shall be clearly marked to indicate the color of the material, process batch number or similar manufacturer’s identification, manufacturer’s name, address of the plant, and date of manufacture. All containers shall be labeled according to the current code of Federal Regulations and shall contain all information necessary to comply with NJSA 34:5A-1, NJ Worker and Community Right to Know Act.

1. Inspection and Testing.

The manufacturer shall provide access for the representative of the Authority's independent testing laboratory to obtain two one-quart production samples of the paint for each production batch. Each sample shall be accompanied by an analysis report showing compliance with specification requirements for the following physical tests:

1. Viscosity.
2. Weight per gallon.
3. Grind.

Testing shall be performed on production batches by the manufacturer and witnessed by the representative of the laboratory or Authority. Compliance with the above requirements must be met before batches are sampled for testing by the Authority Laboratory.

The Authority also reserves the right to randomly sample raw materials during the manufacturing process.

Only Authority approved material conforming to all the requirements of this specification shall be shipped. Any specification deviation will result in rejection of the entire batch. Paint not approved, but shipped, shall be picked up entirely at the manufacturer's expense.

1. Epoxy Resin

Epoxy resin compound shall be specifically formulated for use as a durable pavement marking for hot-spray application at elevated temperatures. The types and amounts of epoxy resins and curing agents shall be at the discretion of the manufacturer, provided that the physical properties and composition specified in this Subsection are satisfied.

1. Physical Properties of the Mixed Compound.
2. Samples

All samples shall be mixed at the ratio specified by the manufacturer and tested at an ambient temperature of 73 ± 5 °F unless otherwise specified.

1. Color

The white and yellow epoxy resin compound, when applied in a wet film thickness of 20 ± 1 mil and allowed to cure, shall meet the following initial color requirements as depicted in Table 913-01.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Table 913-01 Initial Color Requirements** | | | | | | | | | | |
| **Color** | **1** | | **2** | | **3** | | **4** | | **Reflectance Limits Y (%)** | |
|  | **x** | **y** | **x** | **y** | **x** | **y** | **x** | **y** | **Min.** | **Max.** |
| White | 0.302 | 0.344 | 0.325 | 0.344 | 0.302 | 0.320 | 0.325 | 0.320 | 80.0 | 100.0 |
| Yellow | 0.5425 | 0.4718 | 0.4752 | 0.4718 | 0.5425 | 0.4245 | 0.4752 | 0.4245 | 50.0 | 60.0 |

The black epoxy resin compound, when applied in a wet film thickness of 20 ± 1 mils and allowed to cure, shall match color chip No. 37038 of FED-STD-595B.

The blue epoxy resin compound, when applied in a wet film thickness of 20 ± 1 mils and allowed to cure, shall match color chip No. 35180 of FED-STD-595B.

1. Yellowness Index.

When tested according to ASTM D 1925-95 (with glass beads), the white epoxy resin should exhibit the following color stability:

Maximum Yellowness Index before QUV: 10.00

Maximum Yellowness Index after 72 hours QUV: 20.00

1. Directional Reflectance.

The white epoxy resin compound (without glass beads) shall have a daylight directional reflectance of not less than 80 percent relative to a magnesium oxide standard when tested according to ASTM E 1347.

The yellow epoxy resin compound (without glass beads) shall have a daylight directional reflectance of not less than 50 percent relative to a magnesium oxide standard when tested according to ASTM E 1347.

1. Drying Time.

The epoxy resin compounds, when mixed in the proper ratio and applied according to the thickness requirements specified above and immediately dressed with glass beads and wet reflective optics at the rates specified in Paragraphs 913.04(F) and 913.04(G), shall exhibit a no-track drying time of 15 minutes or less when tested according to ASTM D 711.

1. Abrasion Resistance.

When the epoxy resin material is tested according to ASTM C 501 with a CS-17 wheel under a load of 1,000 grams for 1,000 cycles, the abrasive wear index shall be no greater than 80. The abrasive wear index is the weight in milligrams that is abraded from the sample under the specified test conditions.

1. Hardness

After the epoxy resin material has cured for not less than 72 hours and not more than 96 hours at 70 °F, Shore D hardness of the material shall be not less than 75 nor more than 100 when tested according to ASTM D 2240.

1. Epoxy Composition

Black epoxy resin is to be applied with black aggregate to remove any sheen. Use a black aggregate as recommended by the epoxy resin manufacturer.

The epoxy resin material shall be a two-component (Component A and Component B), 100 percent solids type system formulated and designed to provide a simple volumetric mixing ratio (e.g., two volumes of Component A to one volume of Component B) according to Table 913-02:

| **Table 913-02 Epoxy Composition** | | |
| --- | --- | --- |
| **Pigment Composition** | **Percent By Weight** | |
| **Minimum** | **Maximum** |
| **White:** | | |
| Titanium Dioxide Rustile (94% minimum purity) (ASTM D 476, Type III) | 18.0 | 25.0 |
| Epoxy Resin | 75.0 | 82.0 |
| **Yellow:** | | |
| Organic Non-Lead Yellow | 7.0 | 8.0 |
| Epoxy Resin | 77.0 | 79.0 |
| Titanium Dioxide (ASTM D 476, Type III) | 14.0 | 17.0 |
| **Black:** |  | |
| Epoxy Resin | 79% | |
| Black Pigment | 21% | |
| **Blue:** |  | |
| Epoxy Resin | 79% | |
| Blue Pigment | 21% | |

The entire pigment composition shall consist of titanium dioxide. No extender pigments shall be permitted, except in non-lead formula.

The epoxy resin shall be as follows:

1. Epoxy Content (Component A).

The epoxy content of the epoxy resin shall be tested according to ASTM D 1652 and calculated as the weight per epoxy equivalent (WPE). The epoxy content shall be determined on a pigment free basis and shall meet the target value provided by the manufacturer's certification and approved by the Authority. A tolerance of plus or minus 50 will be applied to the target value to establish the acceptance range.

1. Amine Value (Component B).

The amine value of the curing agent shall be determined according to ASTM D 2074. The total amine value shall meet a target value provided by the manufacturer and approved by the Authority. A tolerance of plus or minus 50 will be applied to the target value to establish the acceptance range. If the manufacturer specifies an alternate test method for determining the amine value, the alternate shall be subject to approval by the Authority's Bureau of Materials.

1. Toxicity.

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

1. Sampling and Certified Analysis.

The epoxy manufacturer shall furnish certified test results that each batch of epoxy resin material used on the Project complies with these specifications. In addition, all epoxy components shall be pre-approved for use on the Project. Samples of the epoxy components shall be submitted to the Authority Laboratory at least 30 days before the needed approval date.

To verify that the epoxy resin material subsequently used on the Project is of an identical formulation as those pre-approved, epoxy components shall be sampled at the Project and submitted to the Authority Laboratory. These sample components shall match their respective infrared spectrums in the pre-approved file in the Authority Laboratory.

1. Containers and Shipment

The epoxy resin material shall be shipped in appropriate containers supplied by the Contractor and shall be plainly marked with the following information:

Manufacturer's Name and Address.

1. Name of Product.
2. Lot/Batch Number.
3. Color.
4. Net Weight and Volume of Contents.
5. Date of Manufacture.
6. Date of Expiration.
7. Statement of Contents (As Appropriate):

Component A - Pigment and Epoxy Resin.

Component B - Catalyst.

1. Mixing Proportions and Instructions.
2. Safety Information.
3. Thermoplastic

Thermoplastic for durable pavement markings shall be of either preformed or hot extruded material. The thermoplastic, including pre-mix glass beads, shall conform to the requirements of AASHTO M 249, except as follows:

1. Preformed material shall be 90 mils thick (± 5 mils) and conform to only those portions of AASHTO M 249 not associated with material in a liquid state.
2. For white, the composition of the mixture shall be according to Table 913-03.

| **Table 913-03 Thermoplastic Composition (White)** | |
| --- | --- |
| **Component** | **Percent by weight** |
| Resin/Binder | 22-26 percent minimum |
| Glass Beads (pre-mix) | 30 percent minimum |
| White Pigment | 10 percent minimum |
| Calcium Carbonate and Inert Fillers (shall not contain silica other than as glass beads) | 34-38 percent maximum |

1. For yellow non-lead formulas, the composition of the mixture shall be according to Table 913-04.

|  |  |
| --- | --- |
| **Table 913-04 Thermoplastic Composition (Yellow)** | |
| **Component** | **Percent by weight** |
| Resin/Binder | 22-26 percent minimum |
| Glass Beads (pre-mix) | 30 percent minimum |
| Yellow Pigment | 2 percent minimum |
| Calcium Carbonate and Inert Fillers (shall not contain silica other than as glass beads) | 42-46 percent maximum |

The yellow material's combined totals of lead, cadmium, mercury, and hexavalent chromium shall not exceed 100 parts per million.

Other colors shall be as per table 913-04 with the pigment coinciding with the color of the thermoplastic. Blue shall match color chip No. 35180 of FED-STD-595B.

The thermoplastic manufacturer shall certify, according to Subsection 105.04, that the material will meet the requirements specified.

1. Glass Beads

Glass beads shall meet AASHTO M-247 requirements except as modified and shall be from an approved supplier as listed on the QPL. Drop rates shall be a minimum of 10 pounds per 100 square feet of marking and as directed by the manufacturer.

Glass beads shall be a minimum 40 percent molten kiln direct melt virgin glass.

All glass beads shall be transparent, clean, colorless glass which are smooth and spherically shaped and free of milkiness, pits, or air bubbles. All glass beads shall conform to the following when tested according to Subsection 990.10 and with other appropriate methods:

1. Spherical Particles (Rounds).

Glass beads shall contain a minimum of 80 percent rounds per screen for the two highest sieve quantities. There shall be no more than 3 percent sharp angular particles per screen. The remaining sieve fractions shall contain not less than 75 percent rounds.

1. Gradation.

The beads shall meet the specified grading requirements for marking materials when tested according to ASTM D 1214.

| **Table 913-06 Bead Gradation** | | |
| --- | --- | --- |
| **US Mesh** | **Micron** | **Percent Retained by weight** |
| No. 18 | 1000 | 20-35 |
| No. 30 | 600 | 50-70 |
| No. 50 | 300 | 95-100 |

1. Coating.

The beads shall be coated with a silane adherence coating meeting the requirements of Subsection 990.06, except that pre-mix beads for thermoplastic shall be uncoated and conform to AASHTO M247, Type 1.

Glass beads used with waterborne marking material require a moisture resistant coating.

Additional coatings on glass beads shall be in accordance with the manufacturer’s recommendations.

1. Index of Refraction.

Glass beads, when tested by the liquid immersion method, shall show a minimum refractive index of 1.5.

1. Chemical Stability.

Glass beads that show any tendency toward decomposition, including surface etching, when exposed to atmospheric conditions, moisture, dilute acids or alkalines, or paint film constituents, shall be rejected.

1. Packaging.

The glass beads shall be packaged in moisture-resistant containers conforming to the packaging and marking requirements of AASHTO M 247 and as recommended by the manufacturer.

Each container shall be clearly marked to indicate the material, process batch number or similar manufacturer’s identification, manufacturer’s name, address of the plant, and date of manufacture. All containers shall be labeled according to the current code of Federal Regulations and shall contain all information necessary to comply with NJSA 34:5A-1, NJ Worker and Community Right to Know Act.

1. Pliant, Polymer Rubber Marking Materials

Delete this Paragraph in its entirety.

1. **Black Paint**

Black Paint for obscuring striping shall be from an approved supplier as listed on the QPL and shall be non-reflective and abrasion and weather resistant.

See Paragraph 913.04(A).

1. **Permanent Tape**

Permanent tape shall be a pliant polymer preformed marking material. Permanent tape shall consist of white or yellow preformed patterned markings with white (clear) or yellow retroreflective beads incorporated. When contrast is required for traffic stripes, the material must be pre-formed and retroreflective, consisting of a white or yellow film with retroreflective beads and a contrasting black film border. The contrasting black border must be a nonreflective film bonded on each side of the white or yellow film to form a continuous roll.

The permanent tape shall be affixed to pavement using a pressure sensitive adhesive and following manufacturer’s recommendations and shall be ready for traffic immediately after application. The manufacturer shall have a documented certification program for Contractor credentialing to demonstrate the Contractor’s understanding and adherence to the Manufacturer’s installation recommendations.

Permanent tape shall be as listed in the QPL, or an approved equal shall conform to the following properties in this subsection.

Permanent tape shall be durable and consist of white or yellow films that meet minimum retroreflective luminance values, measured at an Entrance Angle of 88.76° and an Observation Angle of 1.05° which simulate the viewing geometry of a driver at a distance of 100 feet. Minimum retroreflective luminance values are depicted in Table 913-05.

|  |  |  |
| --- | --- | --- |
| **Table 913-05 Average Initial Retroreflectivity at 30-meter Geometry in mcd/m2/lx** | | |
| **Test Method** | **Color** | |
| **White** | **Yellow** |
| Dry (ASTM E1710) | 500 | 300 |
| Wet Recovery (ASTM E2177) | 250 | 200 |

Permanent tape shall integrate a mixture of reflective optics with refractive indices of 2.4 and 1.9.

Permanent tape shall be capable of installation within a recess or on new asphalt as an inlay. Color (daytime and nighttime) shall conform to ASTM D6628

When installed in accordance with the manufacturer’s application recommendations the permanent tape shall be guaranteed to not fade, lift, shrink, or chip for a period of four years from the date of installation. During the warranty period tape shall be guaranteed to:

1. Maintain retroreflectance values above the minimum retained coefficient of dry retroreflection
2. Remain completely adhered to the roadway.
3. Retain sufficient thickness to avoid failure due to complete wear-through.

Provide a written warranty that includes the method of making a warranty claim. in a form acceptable to the Authority.

1. **Wet Reflective Optics**

When combined with standard glass beads, select wet reflective optics shall be from an approved supplier as listed on the QPL. The combined system of glass bead and wet optics shall meet or exceed the retroreflectivity requirements in Table 913-07.

|  |  |  |
| --- | --- | --- |
| **Table 913-07 General Wet Reflective Optic Requirements: Average Initial Retroreflectivity at 30-meter Geometry in mcd/m2/lx** | | |
| **Test Method** | **Color** | |
| **White** | **Yellow** |
| Dry (ASTM E1710) | 500 | 300 |
| Wet Recovery (ASTM E2177) | 250 | 200 |

Wet reflective optics meeting the above retroreflectivity requirements may be elements or glass beads and should have an index of refraction that is 1.65 or greater.

Prior to application, submit certification from the wet reflective optics manufacturer that when applied according to the manufacturer’s application recommendations, the wet reflective optics meet the requirements of above table.

The type, gradation, and application rates for wet reflective optics used must meet the optics manufacturer's recommendation based on the binder material.

[Include the following where protective coating of sheeting is required.]

913.06 Coal Tar Epoxy Coating

Replace the entire Subsection with the following:

Coal tar epoxy coating shall be a two-component, coal tar epoxy-polyamide paint (black) conforming to SSPC-Paint 16.

Add the following Subsection:

913.10 Metallizing Wire

All thermal spray feedstock (metallizing wire) shall be products of a single manufacturer and meet the thermal spray equipment manufacturer’s specifications.

The metallizing wire shall consist of 85/15 zinc/aluminum complying with ASTM B833 and ANSI/AWS C2.25/C2.25M.

Section 914 - Fence

[914.01 Chain Link Fence

Replace Paragraph (F) with the following:

1. Barbed Wire

Barbed Wire shall be Type I, aluminum-coated steel barbed wire conforming to the requirements of ASTM A585.

Include the following if necessary:]

Add the following Subsection:

914.03 Bridge Railing and Fencing

Refer to the QPL.

Section 915 – Beam Guide Rail

Delete this Section in its entirety and replace with the following:

915.01 Rail Element

Rail elements shall be 12-gauge galvanized steel unless noted on the Plans.

Galvanized beam guide rail elements, including transition sections, connections, end treatments, rounded end sections and buffer end sections, shall be fabricated according to AASHTO M 180, Class A, Type I in Table 1. Ensure that the weight of the zinc coating conforms to AASHTO M 180, Type I in Table 2.

1. Pre-Stained Reactive Color Treatment

Galvanized beam guide rail on the Garden State Parkway shall be pre-stained with a reactive color treatment prior to installation to create a uniform, rustic brown matte finish. The stain product shall penetrate the surface of the steel elements without harming the protective galvanized layer. The stain product finish shall be long lasting and resistant to fading, cracking, or peeling from the sun. The stain product finish shall be non-toxic and non-hazardous in its final cured state and shall be resistant to degradation from exposure to roadway salt and weather elements. The stain product shall be applied in one of the following methods for the entirety of pre-stained beam guide rail to be installed for the project:

1. Manufacturer Applied

The stain product shall be applied to galvanized beam guide rail steel elements by the reactive color treatment product manufacturer, at the manufacturer’s facility, prior to the contractor receiving the pre-stained steel elements to be installed. All project beam guide rail shall be pre-stained by the same manufacturer utilizing the same product formula, and applied, stored, and transported to the contractor in a consistent manner. Upon the contractor’s acceptance of the pre-stained steel elements from the manufacturer, the contractor shall store, maintain, and transport the treated materials to the installation site in accordance with the reactive color treatment product manufacturer’s recommendations.

1. Contractor Applied

The stain product shall be applied to the galvanized beam guide rail steel elements by the contractor in a controlled yard environment according to the reactive color treatment product manufacturer’s application instructions. Application of the stain product to new galvanized beam guide rail at the installation site, prior to or after guide rail installation, shall not be permitted. The contractor shall not utilize stain products from more than one reactive color treatment manufacturer or utilize different stain product formulas from the same manufacturer. The contractor shall apply and cure the stain product on all steel elements in a consistent manner. The treated rail elements shall be stored, maintained, and transported to the installation site in accordance with the reactive color treatment product manufacturer’s recommendations.

915.02 Posts and Recycled/Synthetic Blockouts

Steel posts shall be fabricated using structural steel conforming to ASTM A 709, Grade 36, and galvanized according to ASTM A 123.

Galvanized steel posts on the Garden State Parkway shall be pre-stained in accordance with Subsection 915.01.

Timber posts for tangent guide rail terminals and anchorages shall conform to Subsection 910.05.

Use recycled/synthetic routed blockouts that are MASH 2016 test level 3 (TL-3) compliant. Ensure that the name of the manufacturer and model number are stamped on each blockout and that the blockouts are of the same material and dimensions as the spacers that were tested.

915.03 Miscellaneous Hardware

For galvanized beam guide rail, ensure that connections or splices, transition sections, nuts, bolts, washers, and plates conform to AASHTO M 180, except as follows:

1. Parapet connections and buried end terminals
2. Use structural steel plates and shapes conforming to AASHTO M270 and galvanized per AASHTO M111.
3. Use steel for structural tubes conforming to ASTM A500 Grade B and galvanized.
4. Anchorages
5. Use steel foundation tubes conforming to ASTM A53 Grade B.
6. Use strut and yoke assemblies conforming to ASTM A36 and galvanized per ASTM A 123.
7. Use anchor cables conforming to ASTM 1023.
8. Use swaged fitting for cable assemblies conforming to SAE Grade 5 and galvanized.
9. Use breakaway cable terminal sleeve for cable assemblies conforming to ASTM A53 Grade B.

915.04 Sampling and Testing

Samples and rate of sampling taken by the Engineer will be in accordance with AASHTO M180.

915.05 Rub Rail

Rub rail shall be steel channels or bent plate of structural steel conforming to ASTM A709, Grade 36 and galvanized according to ASTM A 123.

Galvanized rub rail on the Garden State Parkway shall be pre-stained in accordance with Subsection 915.01.

915.06 Guide Rail Delineators

Guide rail delineators shall be fabricated from steel sheet plates per ASTM A 6 and galvanized to AASHTO M 232. Retro reflectorized sheeting shall be per ASTM D4956, Type V Abrasive Resistant. Delineator color shall match the adjacent roadway stripe (white or yellow).

915.07 Terminals and Anchorages

Tangent guide rail terminals shall be MASH compliant systems from the QPL. All materials and transition components as necessary to attach to beam guide rail shall be as specified by the device manufacturer in compliance with the MASH conforming configuration.

The MASH compliant tangent guide rail terminal system shall conform to MASH Test Level 3 (TL-3). MASH compliance shall include a FHWA Federal Aid eligibility letter, if issued by the FHWA, and documentation of MASH compliance including crash test videos, crash test results and/or analysis. Installation and materials shall conform to the manufacturer’s detailed drawings and instructions used to determine MASH compliance.

Components from multiple tangent guide rail terminal systems shall not be intermixed.

The various beam guide rail components used to construct the buried end terminals and anchorages shall be fabricated in accordance with Subsections 915.01 through 915.06.

[Include the following if necessary:]

Section 918 – Electrical Materials

918.01 General

Add the following language to the end of this Subsection:

Alternate and other equal materials shall be submitted by the Designer, Engineer, or Contractor to the Authority for approval.

918.02 Bonding and Grounding Devices

1. Ground Rods

Delete the first paragraph and replace it with the following:

Ground rods shall be 3/4 inch in diameter and 10 feet long, composed of steel core with pure copper covering electrolytically plated so that an inseparable molecular bond is secured between the two materials. The minimum thickness of the copper covering on the cylindrical portion of the rod shall average not less than 0.010 inch. Ground Rods shall be UL listed per UL-467, latest edition for the USA.

1. Ground Wire

Delete the first paragraph and replace it with the following:

All grounding and bonding wires smaller than #2 AWG shall be 100% impregnated solid factory color coded green insulated conductors, unless bare are specified. Insulated grounding and bonding wires sized #2 AWG and larger shall be 100% impregnated solid factory color coded green insulated conductors or color coded green heat shrink wrap. 100% impregnated solid factory color coded green insulation is preferred.

Delete the third paragraph and replace it with the following:

Insulated ground wire shall be of uncoated copper conductor conforming to the requirements of ASTM B3 and shall be covered with an insulation that meets or exceeds the requirements of UL Type THWN. Color coding shall be green.

918.04 Cable Connectors

1. In-Line Connectors

Delete the last paragraph.

1. Wye Connectors

Add the following paragraph at the end of this paragraph:

Underground splice kits shall be waterproof fully resin-encapsulated and designed to insulate and seal wire connections in weather-exposed or direct burial locations. Splice kits shall be sized and rated according to the cables to be spliced.

1. Through Splice Connectors

Add the following paragraph at the end of this paragraph:

Underground splice kits shall be waterproof fully resin-encapsulated and designed to insulate and seal wire connections in weather-exposed or direct burial locations. Splice kits shall be sized and rated according to the cables to be spliced.

The following Paragraph is added:

1. Resin-Encapsulation Splice Kits

All kits used to waterproof underground splices, or designated “waterproof” or “resin encapsulated,” shall be fully resin-encapsulating power cable splicing kit (Resin Splice Kit), excluding multi-mold and kits that attach multiple splices via mesh, net, or other flexible means. Kits shall be designed for compression or crimped connectors, including terminal blocks.

Kit shall insulate and seal in-line or wye splices as needed and shall be rated for 1kV for multiple conductor cables or 5kV for single conductor wires. All Resin Splice Kits shall include all materials required for installation and shall fully encapsulate the entire splice with no internal voids or protruding parts.

Resin shall be a two-part epoxy encapsulating and insulating resin. The resin shall be mixed externally and have an exothermic reaction to facilitate its own curing process after injection into the splice cover. The insulating resin shall not run or melt after curing process is complete and shall be stable at elevated temperatures. Insulating resin shall bond to cable jackets and itself and shall be oil resistant.

918.07 Cable and Wire

Delete the last sentence of the second paragraph and add the following:

For cable provided in total Contract quantities 500 feet or more, all multiple lighting and power cable shall have the outside cable jacket layer be continuous 100% factory-impregnated solid color-coded. Inner insulation is not required to be color-coded. For cable provided in total Contract quantities less than 500 feet, use of heat shrink wrap application may be accepted. For pass-through, Junction Box, and Junction Box Foundations, cables shall be taped in lieu of shrink wrap. Tape shall be applied to clean, dry cables and shall be concentrically wrapped such that the entire portion of cable in the JB or JBF is overlapped with no spaces without tape.

1. Multiple Lighting and Power Cable

Replace the color-coding table with the following tables:

|  |  |  |  |
| --- | --- | --- | --- |
| **Phase** | **480Y/277V** | **460Y/265V\*** | **208Y/120V** |
| Phase A | Brown | Brown | Black |
| Phase B | Orange | Orange | Red |
| Phase C | Yellow | Yellow | Blue |
| Neutral | Grey | Grey | White |
| \* Not a standard for new construction and used on some older systems. | | | |

|  |  |  |
| --- | --- | --- |
| **Leg** | **480V/240V** | **240V/120V** |
| Leg A | Brown | Black |
| Leg B | Yellow | Red |
| Neutral | Grey | White |

Delete the last paragraph under the color tables.

1. Type I

Replace the first paragraph and Item (c) with the following:

Cable and wire shall be Type RHW-2 USE-2 as manufactured in conformance with ICEA/NEMA Publication No. S-95-658/NEMA WC70, and shall meet the following requirements:

(c) The jacket, over the insulation, shall be of the Chlorinated Polyethylene (CPE) thermoset compound type conforming to the requirements of ICEA/NEMA Publication No. S-95-658 Section 4.1 – Coverings – Jackets.

Add the following:

1. Type II

Low-Smoke Zero-Halogen (LSZH) Cable and wire for use in confined spaces shall be manufactured in conformance with ICEA/NEMA Publication No. S-95-658/NEMA WC70 and shall meet the following requirements:

1. Stranded copper conductor shall conform to the requirements of the above noted Publication – Part 2, and the concentric stranding shall be Class B, in accordance with Table 2-2.
2. Insulation shall be Low-Smoke, Zero-Halogen flame-retardant Cross-linked Polyolefin (LSZH XLPO) in accordance with NFPA 130, Sections 12.1 – 12.3 and NFPA 502, Section 12.2.
3. Series Lighting Cable

Delete this paragraph in its entirety.

1. Outdoor Network Cable

Delete the first paragraph and replace it with the following:

Outdoor network cable shall consist of 24 AWG solid bare copper conductors, Category 6 or better, 600 Volt outdoor rated twisted pairs, polyolefin insulation, inner LLPE jacket, overall shield (100% coverage), 24 AWG stranded TC drain wire, industrial grade sunlight- and oil-resistant LLPE jacket.

1. Fiber Optic Cable – Multi-Mode

This paragraph is deleted and replaced with the following:

Fiber Optic Cable - Multimode shall be tight buffered breakout type cable. No splices are permitted, except as required for terminations, unless shown on the plans. Fiber Optic Cable – Multimode shall be multi-mode, 50/125/900 micron, OM-3 or better rated cable, tight buffered breakout type cable with each optical fiber protected in individual color coded breakout buffer tubes and Aramid strength fibers. The buffer tubes shall be cabled around a central dielectric strength element with a gel-less water blocking system to inhibit water migration. The cable shall be indoor/outdoor rated, UV resistant, and suitable for use in cable tray, direct burial, underground duct, and aerial installations.

1. Fiber Optic Cable – Termination Connector

Add the following language to the end of this paragraph:

Fiber optic termination connectors for cable between ITS devices and a Systems Control Cabinet (SCC) may be field installed by mechanical means and shall be of the type that matches the connected device or fiber termination panel connector.

1. Twisted Pair Communication Cable

Delete the first paragraph and replace it with the following:

Twisted Pair Communication Cable shall consist of 4 pairs of #24AWG stranded copper conductors, each pair individually shielded, covered by a PVC jacket.

Delete the last paragraph of this paragraph.

1. SOOW Multi Conductor Power Cable

Delete the third and fourth paragraphs and replace them with the following:

Provide cord grip connectors at each cable entry/exit point of the luminaire.

918.08 Conduit and Fittings

1. Flexible Metallic Conduit.

The following to be added as the first sentence:

All Flexible Metallic Conduit (FMC) shall be Liquid-Tight Flexible Metallic Conduit (LFMC) in all installations and applications.

1. Duct Bank Spacers.

Delete the first paragraph and replace it with the following:

Spacers shall be prefabricated and made out of high impact Polystyrene.

The following paragraph is added:

1. HDPE Conduits Directional Drilled Electrical Installations.

All directional drilled conduits shall be SDR-9 HDPE in accordance with ASTM D3350, with cell classification 345440C.

918.11 Radio Coaxial Cable

Delete the first paragraph and replace it with the following:

Coaxial Cable, copper conductors with foam polyethylene insulation, 50 Ohm characteristic impedance. (Unless otherwise noted in the Contract Plans.)

918.13 Lamps

This Subsection is deleted in its entirety.

918.17 Metallic Junction Boxes

Replace the first paragraph with the following:

Metallic junction boxes shall be of the types and sizes as indicated on the Plans. All metallic junction boxes for outdoor use or in tunnels shall be stainless steel.

918.19 System Controller Cabinet (SCC)

Delete the Subsection and replace it with the following:

This Subsection describes the requirements of the metal cabinet used for housing the sign controller and associated equipment separately from the HCMS at the roadside location. The System Controller Cabinet (SCC) shall be suitable for ground mounting and shall be provided with anchor bolts and other hardware required for installation.

1. General Requirements

The SCC shall be a Caltrans 332/334 style aluminum cabinet with front and back 19-inch equipment racks. It shall be designed to mount on a concrete pad, near the DMS. The cabinet shall enclose the sign controllers, fiber patch panel, UPS, batteries, 120 VAC electrical power panels and outlets, and remote communication devices, such as a modem and network switch.

If multiple sign controllers are required for DMS gantries consisting of two separate DMS, all controllers shall fit in the available rack space of one SCC.

Cabinet Size

The controller cabinet shall be 66” ± 1” high by 24” ± 0.5” wide by 30” ± 0.5” deep. The front-to-back cabinet dimensions shall not exceed 38” at its widest point, including the door handles, louvers, and roof overhang.

Cabinet Weight

The controller cabinet weight shall not exceed 200 pounds (45.5 kg) when the cabinet is empty.

Cabinet Construction

The controller cabinet shall be constructed to have a neat and professional appearance. The cabinet shall protect all internal components from rain, ice, dust and corrosion in accordance with NEMA enclosure Type 3R standards, as described in NEMA Standards Publication 250-1997, Enclosures for Electrical Equipment (1000 Volts Maximum).

Internal component hardware (nuts, bolts, screws, standoffs, rivets, fasteners, etc.) shall be fabricated from hot dipped galvanized steel, stainless steel, aluminum, or other durable corrosion-resistant materials suitable for roadway signage applications.

The cabinet shall be constructed using 0.125-inch thick aluminum alloy 5052-H32. The exterior of the controller cabinet shall be natural mill-finish aluminum.

Serviceability

The controller cabinet shall provide safe and convenient access to all modular assemblies, components, wiring, and other materials located within the cabinet. All internal components shall be removable and replaceable by a single technician.

Two (2) vertically hinged doors shall be mounted on the cabinet for interior access. One door shall be located on the front face and one door shall be located on the rear face of the cabinet. Each of the door openings shall not be less than 54” (1,372 mm) high by 21” (533 mm) wide. Each opening shall be sealed with a closed cell foam gasket.

The doors shall be attached to the cabinet by a full-length heavy-duty stainless steel hinge and stainless steel mounting hardware. Both doors shall open outward. In the closed position, each door shall latch to a double-flanged door opening with a three-point draw-roller mechanism. The door handle shall be stainless steel. Each door shall have a doorstop to hold the door in the open position. The doors shall each be equipped with a Corbin #2 lock. The #2 Corbin lock shall have a spring-loaded dust cover.

A lamp shall be located at the top of the controller cabinet to illuminate the cabinet interior. A switch mounted near the front door shall automatically turn on the light when the door is opened.

Equipment Rack

The controller cabinet shall be equipped with a front and back full-height standard EIA 19-inch equipment rack. The rack shall be secured within the cabinet by mounts at the top and bottom.

1. Sliding Drawer

The rack shall contain a minimum of one (1) pullout stainless steel or aluminum drawer. The drawer shall have a hinged cover and be suitable for storing manuals and small tools, such as screwdrivers. The drawer shall be able to latch in the out position to function as a laptop/utility shelf.

1. Equipment Tray

The rack shall contain a minimum of one (1) stainless steel or aluminum fixed tray. The tray shall be suitable for optional or future non-rack mountable equipment, such as power-over-Ethernet injectors or surge protectors. The equipment shelf shall not be used for rack mountable equipment supplied with the SCC, such as sign controllers, UPS, or batteries. The approximate shelf dimensions shall be 5”H x 19”W x 18”D. The top edges of the tray shall be insulated with nylon edging to prevent the chafing of wires.

Cabinet Base

The controller cabinet shall be installed on a 12-inch high aluminum base with approximately the same width and depth as the cabinet bottom. The base shall have an open top and bottom with a continuous lip for attachment to the cabinet and concrete pad. The base shall be attached to the cabinet with stainless steel bolts, nuts, washers, and lock washers provided with each cabinet.

Local Control Compartment

The SCC front door for an HCMS shall contain a switch compartment for local message control of the DMS. The local control compartment door shall be vertically hinged and provided with a neoprene continuous gasket for a water-tight seal. The door shall be equipped with a brass skeleton key lock to match existing Authority keying requirements and a swivel dust cover. One local control compartment key shall be provided with each cabinet.

1. Electrical System
2. Power Panels
3. Utility Power Panel

The cabinet shall contain a utility (non-UPS) power panel board and circuit breakers that meet the following minimum requirements:

• Service entrance-rated

• 50 Amps, main breaker input

• Minimum of 12 snap-in circuit breaker mounting positions

• Short circuit ratings of 10,000 Amps for the branch circuits

• UL listed

• Printed branch circuit label

The cabinet shall include one (1) earth ground lug that is electrically bonded to the cabinet. The lug shall be installed near the power entrance. The installation contractor shall provide the balance of materials and services needed to properly connect to earth ground. All earth grounding shall conform to the National Electrical Code.

1. UPS Power Panel

The cabinet shall contain a UPS power panel board and circuit breakers for connection of electronic equipment within the SCC and other equipment outside of the cabinet, such as a CCTV camera. The UPS Power Panel shall meet the following minimum requirements:

• 50 Amps, main lugs input

• Minimum of 4 branch circuits

• Short circuit ratings of 10,000 Amps for the branch circuits

• UL listed

• Printed branch circuit label

1. Circuit Breakers

The utility and UPS power panels shall be equipped with snap-in single-pole and double-pole thermal-magnetic circuit breakers of the appropriate current and voltage ratings for the intended loads and in accordance with the National Electric Code. The circuit breakers shall have a color-coded visual indication of when the breaker is tripped. Tandem circuit breakers may be provided in the UPS Power Panel to provide a minimum of 4 circuits.

Uninterruptible Power Supply (UPS)

The SCC shall be furnished with a UPS to maintain and provide conditioned power to key electronic devices as specified herein. The UPS shall be a rack mounted, environmentally hardened, line-interactive type. The UPS shall be supplied with extended temperature range batteries, an external automatic bypass switch, and a generator transfer switch as specified herein.

The UPS and batteries shall be sized and wired to supply the following loads for a minimum of four (4) hours in the event of a power failure:

* All Contractor furnished and installed VMS or HCMS controllers and associated electronic devices.
* For HCMS installations, a minimum of two message changes for each drum sign portion of the HCMS.
* One PTZ video camera supplied by others (100 Watt max. load)
* Two Traffic monitoring devices supplied by others (50 Watt max. load)
* Communications device(s) (i.e., router, modem, radio, network switch, etc. supplied by others (200 Watt max. load)

The LED portion of a VMS or HCMS shall not be powered by the UPS or included in the UPS and battery sizing requirement. The LED portion of a VSLS or Lane Control Sign shall be powered by the UPS and included in the UPS and battery sizing requirement.

The output of the UPS shall be connected to all protected equipment inside the SCC through a properly rated flexible line cord to a vertical power strip with a minimum of ten (10) NEMA 5-15R 120v surge protected outlets.

All AC line cords in the SCC, whether for UPS power or unprotected utility power, shall be neatly labeled near the plug using flexible wire ID tape, machine printed with permanent ink, identifying the connected load.

1. Operating Specifications

The UPS shall meet or exceed the following operating specifications:

* Output Power Rating: 2,000VA, 1500W
* Input Voltage Range: 90VAC to 150VAC
* Input Frequency: 60Hz ±5%
* Input Configuration: 3-wire (hot, neutral, and ground)
* Output Voltage: 120VAC ±10% over full input voltage range
* Output Frequency: 60Hz ±.05%
* Output Waveform: True sine wave
* Typical Transfer Time: <5ms
* Overload Capability: 110% for 10 minutes, 200% for 0.5 seconds
* Efficiency: 98% (resistive)
* Line Transient Protection: ANSI/IEEE C.62.41/C.62.45 Cat A&B
* Operating Temperature Range: -35 to +74ºC
* Humidity Range: 0% to 95% non-condensing
* Size (maximum): 17”W x 10”D x 5.25”H (3RU)
* Weight (maximum): 35 pounds
* UPS Protection: Input and output short circuit; input and output overload; excessive battery discharge
* Communications: Serial Interface (monitor, control and calibrate), DB-9 or USB connector and Ethernet interface with SNMP support
* Front panel display indicators: Fault, Test, Low Battery, On Battery, Online
* Battery recharge time: 2-8 hours; must be temperature-compensated

1. UPS Communications and Alarms

The UPS shall include RS-232 serial, open-collector signal, and 10Base-T Ethernet ports for remote monitoring and control of the UPS and battery system.

The UPS RS-232 serial port shall be connected directly to the VMS or HCMS controller to allow the controller to notify the central control server that local power has been lost. Additionally, the UPS Ethernet port shall be connected to the SCC network switch to allow remote access to extended UPS status information.

1. Batteries

The UPS shall be provided with a bank of 12 VDC Valve Regulated Lead Acid batteries with Absorbent Glass Mat (AGM) plate separators, connected in a series or series/parallel configuration to provide the required UPS input voltage and specified maximum load battery runtime. The batteries shall be rated for -40° F to 122° F operating temperature range and designed for a 10-year minimum life expectancy in float service at 77° F. The batteries shall be arranged in the SCC for easy access to the battery terminals for voltage measurement and battery replacement. The terminals shall be coated with an appropriate dielectric grease to minimize oxidation and corrosion. The batteries shall be securely mounted near the bottom of the SCC or, if required due to space constraints, in a separate battery compartment mounted to one side of the SCC. UPS batteries may be crated and shipped separately from the SCC to prevent shipping damage.

1. Automatic Bypass Switch (ABS)

The UPS system shall include an external ABS made by the same manufacturer and fully compatible with the supplied UPS. The ABS shall be wired to the utility power and the UPS so that UPS power is supplied to the UPS loads while on utility power or battery power. In the event of a UPS failure or battery discharge, the ABS shall automatically bypass the UPS inverter and switch utility power to the UPS loads. The ABS shall also allow the UPS load to be manually transferred to utility power to allow the UPS to be serviced or replaced without interrupting power to the load.

1. Generator Connection

The SCC shall include a single external generator plug, fully compatible with the supplied UPS(s). Where two UPS’s are being powered from one generator plug, each UPS shall be connected to a different phase. The generator plug shall be a 30Amp, 120VAC, 4-wire twist-lock receptacle with male connectors and a water-tight cover for operation of the UPS(s) during an extended power outage.  One mating twist-lock plug shall also be provided with each SCC for connection by others to a backup generator. The generator input receptacle shall be mounted through one side of the SCC to allow connection to a generator without opening the cabinet doors. The SCC and receptacle orientation shall be coordinated on a site-by-site basis to assure clearances for access and NEC code compliance.  The UPS shall perform automatic transfer to generator input when both utility power is lost and 120VAC is applied to the UPS through the generator plug.

Convenience Outlets

The SCC shall contain a utility outlet circuit consisting of a minimum of one (1) 15-A NEMA 15-R, 120 VAC duplex receptacle, with a ground-fault circuit interrupter located for optimum access and convenience. The convenience outlets shall not be connected to the UPS output.

Ground Bar

A copper ground bar, such as Square-D model PK12GTA, shall be mounted near the bottom of the cabinet to provide a convenient grounding point for surge protectors, shielded cables and other devices within the cabinet. The ground bar shall have a minimum of 12 grounding screw terminals and shall be bonded to the cabinet’s main power grounding point by way of a #6 AWG green insulated copper wire secured along one side of the cabinet.

Transient Protection

The SCC signal and power inputs shall be protected from electrical spikes and transients as follows:

1. AC Mains Power

The AC power feed for all equipment shall be protected at the load center by a parallel-connection surge suppressor rated for a minimum surge of 10 KA. The surge suppressor shall be connected to the load center through an appropriately rated branch circuit breaker and shall include auxiliary contacts to provide an alarm indication to the VMS or HCMS controller in the event of a surge suppressor fault condition.

1. Control Equipment AC Power

A series-connected surge suppressor capable of passing 15 Amps of current shall protect the sign controller and other control and communication equipment. This device shall conform to the following requirements:

• Withstand a peak 50,000 Ampere surge current for an 8x20 microsecond waveform

• Maximum continuous operating current of 15 Amps at 120 VAC, 60 Hz

• Series inductance of 200 micro Henrys (nominal)

• Temperature range as specified in NEMA Standards Publication TS 4

• The device shall be UL-1449 recognized

• UL 1449 surge rating of 400 V or less

1. Communication Signals

Multi-stage transient voltage surge suppressors shall protect all communication signals connecting the control equipment from off-site sources using copper cables. Transient voltage surge suppressors shall protect all copper communication lines used to pass data between the sign controller and sign.

1. Environmental Systems
2. Exhaust Fan

One (1) thermostatically controlled 100 CFM exhaust fan shall be mounted near the top of the SCC. The fan shall be removable and replaceable from inside the cabinet. The exhaust fan shall not be powered by the cabinet UPS. The fan thermostat shall include a manual adjustment and a nonadjustable high temperature limit switch.

Air Filters

Filtered air intake ports shall be located on the bottom third of each access door. The air filters shall be of a standard size and shall be removable and replaceable from inside the cabinet. The air intake ports shall be protected by louvered vents and tight mesh insect screens.

1. Communications Equipment

The Contractor shall furnish and install a Fiber Termination Panel (FTP) and all required interconnecting copper and fiber optic patch cords in each SCC. The Authority will furnish, install and configure a rack mounted network switch and provide a functional communications link between each SCC and the Traffic Management Center.

1. Network Switch

The Authority will furnish, configure, and install a rack mounted Network Switch in the SCC. The Contractor shall furnish and install communications equipment indicated on the plans and all fiber optic and copper cable patch cords necessary for connection of all Contractor furnished equipment to the network switch. The Authority will furnish and install all fiber optic and copper cable patch cords necessary for connection of the network switch to equipment not furnished under this contract. The Authority provided network switch requires duplex LC connectors for fiber connections and RJ45 connectors for copper connections.

Fiber Termination Panel

The Contractor or a third-party communications contractor indicated on the plans shall furnish and install a Fiber Termination Panel (FTP) within the SCC. The FTP shall be a compact 19” rack mounted unit for interconnectivity and termination of optical fibers with a slide out master panel and removable top cover for accessing terminations and splicing. The panel shall be provided with 19” rack mounting hardware and meet the following general requirements:

General Requirements:

* Dimensions (max.): 1.87”H x 17.0”W x 9.75”D
* Capacity: Three (3) fiber optic adapter panels
* Material: 16 Gauge Steel
* Finish: Black electrostatically applied powder coat

The SCC FTP shall be as manufactured by Multilink, Inc. model FRM-1RU-3X-TS-S, or approved equal.

Each SCC FTP shall be provided with two (2)12-port fiber adapter panels with beige duplex multi-mode SC connectors for internal and external communications and one (1) 12-port panel with blue duplex SC connectors for single mode remote communications or one (1) 12-port panel with aqua duplex SC connectors for 50-micron fiber multi-mode remote communications. Each connector shall be provided with a plastic dust cap for protection when not in use. The SCC FTP is intended for termination and interconnection of all fiber optic cables entering the SCC, except for cables provided by the DMS contractor for connection of the SCC to the DMS.

918.20 Power Distribution and Control Equipment

1. Panelboards and Circuit Breakers.

Replace the first paragraph with the following:

Panelboards for 600V and below systems shall be single phase 3 wire or 3-phase 4-wire system, and each shall be equipped with integrated surge protection, a solid neutral, a main circuit breaker or main with lugs as specified. Panelboards shall be UL listed, comply with NEMA standards and conform to Federal Specification W-P-115A. Surge protection shall be a minimum of 100kA per phase.

1. Distribution Transformers.

Replace this Subsection entirely with the following:

Distributions transformers shall be totally enclosed and dry-type, designed for indoor/outdoor applications suitable for wall or floor mounting as required, and shall meet the phase, KVA, primary and secondary voltage and tap requirements indicated on the Plans and Specifications.

Transformers shall be stored in accordance to manufacturer’s recommendations in a climate-controlled facility. Contractor shall install and energize the transformer within 2 months of obtaining the transformer from the manufacturer.

1. Transformers Installed Indoors or within Electrical Cabinets (rated 600V and below)

The insulation and material shall be Class H which will not permit a temperature rise of 115°C above the 40°C ambient, when tested in accordance with ANSI and NEMA standards.

The core and coil assemblies of transformers below 600V class for up to 37.5kVA, single phase and 15KVA, three phase shall be epoxy encapsulated.

The transformers shall be designed to maximize energy efficiency requirements as per NEMA TP1-2002 and tested in accordance with Harmonic Mitigation requirements of NEMA ST 20 and UL-506 and shall bear the UL label.

The transformer enclosures shall be degreased, primed, and furnished with a coat of outdoor enamel paint and shall be stored in accordance to manufacturer’s recommendations in a climate-controlled facility.

1. Transformers Installed Outdoors (rated 600V and below)

Transformers shall be NEMA 3R stainless steel. It is acceptable for the enclosure to be rated NEMA 2 stainless steel and furnished with a stainless steel weather shield to obtain the NEMA 3R rating.

Transformer shall have aluminum windings, insulation class 220°C, and maximum of 150°C rise above 40°C ambient temperature.

The insulation and material have a temperature rise of 150°C above the 40°C ambient, when tested in accordance with ANSI and NEMA standards.

All components must be dipped in solid-base varnish (not water-based varnish).

If the manufacturer does not furnish the transformer enclosure with stainless steel screws, the Contractor will be required to replace all screws (replacing a few at a time, not all at once) for the transformer with stainless steel screws.

1. Transformers Installed Outdoors (rated above 600V)

Transformers shall be NEMA 3R, 316 stainless steel enclosure with weather shield. Transformers shall be UL listed and incompliance with applicable NEMA standards. Transformers shall be dry-type with copper windings, insulation shall be class 220°C, and maximum of 115°C rise above 40°C ambient temperature. Transformers shall be 20kV-BIL class, of low inrush design, with Stub-Down terminations, and with cable in/out design.

1. Constant Current Transformers

Delete this Paragraph in its entirety.

1. Capacitor Assemblies

Delete this Paragraph in its entirety.

Add the following Paragraph(s):

1. Warning Labels

Panels are to be labeled with a warning label with the title “Arc Flash and Shock Risk Appropriate PPE Required” and including the following information: flash hazard at incident energy, flash protection boundary, site specific PPE, required PPE, shock hazard when cover is removed, limited approach distance, and restricted approach distance. Label shall also include the Authority’s location ID, Interchange location, date prepared and designer.

Sample label shown below:



1. Manual Transfer Switches

All lighting load centers shall include a manual transfer switch as shown on the Standard Drawings. The transfer switch shall be rated for the current and voltage as required on the Contract Drawings.

The transfer switch shall be UL Listed and be compatible with Authority portable generator connections and interlocks.

A. Manual transfer switch shall consist of (2) two mechanically interlocked molded case circuit breakers; kirk-locks are not acceptable, cam-style male connectors, power distribution block and grounding terminals, all housed within a padlockable enclosure.

B. Manual transfer switch enclosure shall be Type 3R, constructed of continuous seamwelded, stainless steel. The main access shall be through an interlocked, hinged door that extends the full height of the enclosure. Access for portable generator cables with female cam-style plugs shall be via a) drawn flange cable entry openings in the bottom of enclosure for wall mount units, or b) hinged lower door for pad mount units. A hinged flap door shall be provided to cover the cable openings when cables are not connected; the hinged flap door shall allow cable entry only after the main access door has been opened.

C. Number of male input cams shall not exceed the number as shown on the drawings and must be rated for the specified amperage.

D. Cam-style male connectors (inlets) shall be UL Listed single-pole separable type and rated 400 amps at 600VAC. Cam-style male connectors shall be color coded. Cam-style male connectors shall be provided for each phase and for ground and shall also be provided for neutral if required. A corresponding female cam-style connector shall be provided for each male connector by the same manufacturer. Female cam-style connectors shall be delivered to the Authority. Each of the phase cam-style male connectors within the enclosure shall be factory-wired to a molded case circuit breaker. The ground cam-style male connectors shall be bonded to the enclosure, and a ground lug shall be provided for connection of the facility ground conductor. The neutral cam-style male connectors, if required, shall be factory wired to a power distribution block. None of the cam-style male connectors shall be accessible unless both molded case circuit breakers are in the “OFF” position and the main access door is open.

E. A power distribution block shall be provided for load-side field wiring. The power distribution block shall be factory wired to the molded case circuit breakers.

F. Molded case circuit breakers shall be UL Listed, and the short circuit interrupt rating shall be a minimum of 35kAIC at 480VAC. Trip rating of the molded case circuit breakers shall be as shown on the drawings. One molded case circuit breaker shall be fed from utility power; the other molded case circuit breaker shall be fed from the camstyle male connectors to supply power from a portable generator. Both molded case circuit breakers shall include UL Listed door-mounted operating mechanisms (with provisions for a locking device), preventing the opening of the main access door unless both breakers are in the “OFF” position. Both molded case circuit breakers shall be mounted behind a deadfront panel. The load-side of the molded case circuit breakers shall not be energizable unless the main access door is closed and one of the molded case circuit breakers is in the “ON” position. The (2) molded case circuit breakers shall be safety interlocked by mechanical means to ensure that only one breaker can be closed at any given time.

G. Manual transfer switch shall be suitable for use as service equipment in the USA as defined by the NEC.

H. Manual transfer switch shall include permanently affixed operation instructions.

1. Contactor

Lighting Contactors shall be commercial off-the-shelf (COTS) contactors with 100amp frame and 120V magnetically held coil, without enclosure. Contactor poles and control circuit voltages shall be:

1. 2-Pole 120/240V contactor
2. 2-Pole 120/240V contactor
3. 2-Pole 120/240V contactor
4. 2-Pole 120/240V contactor
5. Load Center Power Monitoring Unit

All new Load Centers shall be equipped with a data logging, power and energy monitoring unit, referred generically as Power Monitoring Unit (PMU). The PMU will be used in conjunction with The Authority’s BMS system to remotely monitor Load Center performance and efficiency.

Refer to the QPL for approved manufacturers.

918.21 Roadway Lighting Luminaires

Replace the first paragraph with the following:

Luminaire Types and configurations shall be as indicated on the Plans. Refer to QPL for approved luminaires and suppliers.

1. LED Luminaires

Add the following after the fifth paragraph, just before Item 1:

When luminaires are to replace existing legacy luminaires in an existing installation, the replacement luminaires shall be designated as “retrofit”. Retrofit luminaires shall closely match the form factor, lumen output, distribution type, and color temperature of the luminaire they replace. The retrofit luminaires shall be LED as below in 918.21(A)4, Type Z

1. Construction

Replace the second paragraph with the following:

The maximum effective projected area shall not exceed 1.31. The housing shall be grey in color with a flat or semi-gloss sheen. Luminaire shall include a 7-pin NEMA photo-control receptacle.

Item (1), Replace the fifth, sixth, and seventh paragraphs with the following:

The luminaires shall be equipped with a universal slip fitter mounting device capable of adapting to 1-1/4 inch through 2-inch pipe size bracket arms or vertical tenons, without the need of separate mounting parts. As pole sizes vary, the slip fitter shall be sized appropriately to the pole it will be mounted on. See the Standard Drawings for mounting device construction and dimensions. Leveling and clamping of the luminaires to the bracket arm shall be accomplished by tightening of four bolts. The mounting end of luminaires shall be provided with an appropriate means of covering the opening to prevent bird infiltration into the luminaire housings. The luminaires may also be equipped such that the luminaire slips over the top of the light pole (4 inches to 6 inches diameter) and be secured.

The luminaires shall have adequate provisions for the dissipation of heat radiated from the electronic driver. All luminaires shall have a durable baked-on acrylic gray finish, inside and out, and shall be furnished with corrosion-resistant hardware.

When luminaires are to replace existing legacy luminaires in an existing installation, the replacement luminaires shall be designated as “retrofit”. Retrofit luminaires shall closely match the form factor, lumen output, distribution type, and color temperature of the luminaire they replace. The retrofit luminaires shall be LED as below in 918.21(A)4, Type Z.

1. Electrical Requirements

Add the following language to the end of Item (2)(a):

In a system in which there is a neutral conductor shared by multiple phase conductors (primarily retrofit installations) the luminaire shall be protected from overvoltage up to 500V from a loss of neutral or other overvoltage event via the LED driver or transformer, fully contained within the luminaire. External transformers will not be approved.

Add the following to the end of Item 2:

(f) Lighting System upgrades shall include new wiring such that each phase conductor has a discrete neutral conductor. In the rare case where an installation is approved without neutral upgrade(s), the lighting system will remain at-risk to an overvoltage condition.

1. Photometric Requirements

Replace the first and second paragraphs with the following:

The luminaires shall produce light distributions in conformance with the current ANSI/IES classifications indicated in the Luminaire Types in this section and shall meet the photometric requirements shown on the Plans. Additional distributions for glare control shall be utilized when direct source must be mitigated. Mitigation utilizing shielding elements shall require approval from the Authority. Optical assemblies shall have a minimum efficiency of 85% regardless of distribution type.

As part of the shop drawing submittal, the contractor shall include the IES files (.ies) for each luminaire type to be installed. The following information shall also be included in the shop drawing submittal, if not in the catalog cut(s) and/or photometric file:

Add the following to the end of Item (3):

1. Unless otherwise noted in descriptions below, all roadway luminaires shall have a color temperature of 4000°-5000°K and Color Rendering Index (CRI) of 65 or higher.

Add the following Item(s):

1. Luminaire Types

The following is a list of the Standard Luminaires for the Turnpike and Parkway. The list contains the general illumination characteristics. Luminaire type designations are based on the design area they are primarily intended to illuminate, as well as lumen output and light distribution. When submitting a luminaire to the Authority, the Authority shall make the final determination of the catalog number of each approved make and model luminaire to be used for the Luminaire Types listed here. Those who are submitting luminaires for approval should initially make a determination what luminaire catalog number fits best for each Authority “LP”, “LH”, “LW”, or other luminaire designation.

Pole spacing listed is for straight roadway or a roadway with a radius of greater than 1000 feet. All luminaires listed shall perform to the specifications below with a zero-degree (0°) tilt and one-sided pole spacing arrangement. Target illumination levels for qualification purposes are 0.70 fc – 0.85 fc, with a minimum average illumination level of 0.70 fc, maximum average illumination of 1.20 fc, minimum point illumination value of 0.20 fc, and uniformity ratio of 4.0:1 or better.

Any luminaire to be considered for addition as a Standard Luminaire shall be determined to be acceptable by demonstration that it has close similarity to and within the limits of illuminance performance and uniformity to the luminaire type it is to be considered.

1. Type LP1 Luminaire - Pole-top roadway luminaire with for Design Areas less than 48 feet in total width utilizing a Type III roadway distribution, nominal mounting height of 26 feet, standard offset from edge of pavement, and 75-120 foot pole spacing.
2. Type LP2 Luminaire - Pole-top roadway luminaire with for Design Areas less than 48 feet in total width utilizing a Type II roadway distribution, standard offset from edge of pavement, 100-175 foot pole spacing at 26’ nominal mounting height, and 75-120 foot pole spacing at 40 feet nominal mounting height.
3. Type LP3 Luminaire - Pole-top roadway luminaire with for Design Areas less than 60 feet in total width utilizing a Type III roadway distribution, 100-150 foot pole spacing at a nominal mounting height of 40 feet, and standard offset from edge of pavement.
4. Type LP4 Luminaire - Pole-top roadway luminaire with for Design Areas less than 60 feet in total width utilizing a Type II roadway distribution, 135-190 foot pole spacing at a nominal mounting height of 40 feet, and standard offset from edge of pavement.
5. Type LP5 Luminaire - Pole-top roadway luminaire with for Design Areas less than 60 feet in total width utilizing a Type III roadway distribution, 170-235 foot pole spacing at a nominal mounting height of 40 feet, and standard offset from edge of pavement.
6. Type LP6 Luminaire - Pole-top roadway luminaire with for Design Areas 48 feet or greater in total width utilizing a Type III roadway distribution, 200-250 foot pole spacing at a nominal mounting height of 40 feet, and standard offset from edge of pavement. Type LP6 may also be used at toll plaza approaches and areas with special geometry.
7. Type LP7 Luminaire - Pole-top roadway luminaire with for Design Areas 48 feet or greater in total width utilizing a Type III roadway distribution, a nominal mounting height of 40 feet, and standard offset from edge of pavement. The primary use for the Type LP7 luminaire is toll plaza approaches. The Type LP7 luminaire may also be used for special geometry where other approved luminaires are proven to not meet criteria.
8. Type LP8 Luminaire - Pole-top roadway luminaire with for Toll Plaza Design Areas and special geometry areas with 25,000-40,000 lumens, utilizing a Type IV (forward throw) roadway distribution, a nominal mounting height of 40 feet, and standard offset from edge of pavement.
9. Type LP9 Luminaire - Pole-top roadway luminaire with for special geometry areas with 10,000-25,000 lumens, utilizing a Type IV (forward throw) roadway distribution, a nominal mounting height of 26 or 40 feet, and standard offset from edge of pavement.
10. Type LC Luminaire - Toll Canopy luminaire with for use under toll and fuel canopies with 4500-7500 lumens or 8500-15000 lumens and Type V square or long distribution.
11. Type LW1 Luminaire - Under Bridge luminaire with Low to medium lumen (4500-7500 lumens) luminaire with square or round Type V distribution, mounted above the roadway and typically attached to the underside of the bridge via fabricated supports.
12. Type LW2 Luminaire - Under Bridge luminaire with Low to medium lumen (4500-7500 lumens) luminaire with forward throw Type IV distribution, mounted above the roadway and typically attached to the underside of the bridge via fabricated supports.
13. Type LW3 Luminaire - Under Bridge luminaire with high lumen (8500-15,000 lumens) luminaire with square or round Type V distribution, mounted above the roadway and typically attached to the underside of the bridge via fabricated supports.
14. Type LW4 Luminaire – Under Bridge luminaire with High Mast type luminaire with square or round Type V distribution and 15,000-65,000 lumens, mounted above the roadway and typically attached to the underside of the bridge via fabricated supports.
15. Type LH1 Luminaire – High Mast roadway luminaire with low lumen (25,000-35,000 lumens) square or round Type V medium-to-wide distribution.
16. Type LH2 Luminaire – High Mast roadway luminaire with medium lumen (35,000-50,000 lumens) square or round Type V medium-to-wide distribution.
17. Type LH3 Luminaire – High Mast roadway luminaire with high lumen (50,000-65,000 lumens) square or round Type V Wide distribution.
18. Type SP Luminaire – Security Perimeter luminaire with dual heads and battery backup.
19. Retrofit LED Cobrahead luminaire – Retrofit luminaires shall utilize mast arm mounting where replacing legacy Types A, B, C, and D “Cobrahead” luminaires. Retrofit luminaires shall have a color temperature between 2700° Kelvin (K) and 3300° K, shall have a similar light distribution as the luminaire they replace, and may include options such as House Side Shield to achieve the same distribution.
20. HID Luminaires

Delete this paragraph in its entirety.

1. Ballast Assemblies

Delete this paragraph in its entirety.

918.22 Sign Lighting Luminaires

Delete the first paragraph and replace it with the following:

Sign lighting luminaires shall be designated as Type LS, as described in this section. The Contractor may submit an alternate luminaire for approval by submitting photometric calculations to the Engineer as a shop drawing process in accordance with Section 104.08.

918.23 Underbridge Lighting Luminaires

Delete the entire Subsection and replace it with the following:

1. LED Luminaires

LED luminaires to be used for under bridge illumination shall consist of an assembly that utilizes LEDs as the light source. In addition, a complete luminaire shall consist of a housing, LED array, and electronic driver (power supply). Each luminaire shall be rated for a minimum operational life of 50,000 hours at an average operating time of 11.5 hours per night at 40ºC (104ºF) while maintaining greater than 70% of its initial lumen output (L70).

The individual LEDs shall be constructed such that a loss or the failure of one LED will not result in the loss of the entire luminaire. Luminaire shall be constructed such that LED modules may be replaced or repaired without replacement of whole luminaire. Each luminaire shall be listed with Underwriters Laboratory, Inc. under UL1598 for luminaires, or an approved equivalent standard from a nationally recognized testing laboratory and shall have a certification label.

All luminaires of the same type and Wattage to be installed under the same Contract shall be physically identical unless otherwise approved by the Engineer.

Luminaires shall be protected with a 6A fuse in the first above-ground junction box, conforming to applicable requirements of Subsection 918.04.

(1) Construction.

The LED luminaire housings shall be die-cast aluminum frame, extruded aluminum heat sinks to an independent electrical compartment. Housing and door frame shall be aluminum with a nominal 2.5mil thick paint finish able to withstand a 3000-hour salt spray test as specified in ASTM designation, B117. Access to the electrical compartment shall be tool-less. The die cast aluminum housing shall be designed to prevent the buildup of water on the top of the housing. Exposed heat sink fins shall be oriented so that water can freely run off the luminaire to carry dust and other accumulated debris away from the unit. Housing shall have cast in pipe, leveling steps and mounting system capable of accommodating 2-3/8 inches OD.

The housing shall be grey in color with a flat or semi-gloss sheen. Luminaire options to include a 7-pin NEMA photo-control receptacle and the fixture shall be furnished with a shorting cap. The housing shall be provided with a drilled and tapped hole for 3/4 inch conduit on each side, complete with threaded flush plug.

The assembly and manufacturing process for the LED luminaire shall withstand vibration, meeting ANSI C136.31 American Standard for Roadway and Area Lighting Equipment-Luminaire Vibration for both normal and bridge operation.

The optical assembly of the luminaire shall be protected against dust and moisture intrusion per the requirements of IP-66 to protect all optical components. The electronics/power supply enclosure shall meet the requirements for NEMA/UL wet location.

The optical assemblies shall consist of highly polished and anodic or chemically bonded glass surfaced aluminum reflector to achieve the required photometrics and impact resistant flat tempered glass refractor equipped with a high temperature gasket to provide a completely sealed optical assembly. The gasket shall be a single piece polyester fiber attached around the full perimeter of the reflector to prevent contaminants from entering the optical system. Breathing action of the sealed optical assembly shall be accomplished by means of the reflector gasket, unless otherwise specified.

The luminaires shall have adequate provisions for the dissipation of heat radiated from the electronic driver. All luminaires shall be furnished with corrosion-resistant hardware.

(2) Electrical Requirements.

The electrical requirements to be submitted as part of the shop drawing submittal, shall conform to the requirements set forth in Subsection 918.21.

(3) Photometric Requirements.

The photometric data to be submitted as part of the shop drawing submittal, shall conform to applicable requirements set forth in Subsection 918.21.

1. Luminaire Types

The following is a list of the Standard Under Bridge Luminaires for the Turnpike and Parkway. The list contains the general illumination characteristics.

1. Type S1 Luminaire - Under Bridge Structure mount luminaire with low to medium lumen (4500-7500 lumens) luminaire with Type III roadway distribution, typically mounted to walls, piers, or abutments.
2. Type S2 Luminaire - Under Bridge Structure mount luminaire with low to medium lumen (4500-7500 lumens) luminaire with Type IV roadway distribution, typically mounted to walls, piers, or abutments.
3. Type S3 Luminaire - Under Bridge Structure mount luminaire with low to medium (4500-7500 lumens) lumen luminaire with Type V roadway distribution, typically mounted to walls, piers, or abutments.
4. Type S4 Luminaire - Under Bridge Structure mount luminaire with high (8500-15000 lumens) lumen luminaire with Type IV roadway distribution, typically mounted to walls, piers, or abutments.
5. Type S5 Luminaire - Under Bridge Structure mount luminaire with high (8500-15000 lumens) lumen luminaire with Type V roadway distribution, typically mounted to walls, piers, or abutments.

918.31 CCTV Camera

1. General

The first sentence of the second paragraph has been replaced with:

The camera shall be an outdoor rated day/night PTZ camera and shall have a 1080p HD resolution, high dynamic range, a 30x optical zoom factor, a clear impact resistant polycarbonate bubble, and support High Power-over-Ethernet communications.

1. The camera shall comply with the following specifications and standards.

Delete the table and add the following:

Refer to the QPL for approved suppliers.

918.33 Pole Mounted ITS Enclosure

Delete the last paragraph.

918.34 Video Encoder

Delete the Subsection in its entirety.

918.38 Traffic Sensor Wireless Access Point (TS-WAP)

Delete the first paragraph and replace it with the following:

The Traffic Sensor Wireless Access Point shall serve as a communication hub for the in-pavement wireless sensors (918.37). A wireless access point shall be able to support at least 48 sensors. An access point shall be factory-configured to support powering from a Power-Over-Ethernet Power Injector with 110VAC input. Maximum power consumption of the wireless access point shall be 2 Watts.

Delete the first paragraph of Paragraph (A) and replace it with the following:

The access point shall have a host processor consisting of 66 MHz Coldfire processor, 4 MB of flash memory, and 16 MB of DRAM. The Ethernet interface shall have the following characteristics:

918.39 Traffic Sensor Wireless Repeater (TS-WR)

Delete the second paragraph and replace it with the following:

The Wireless Repeater shall have a minimum battery life of Eight (8) years in active service.

918.40 In-pavement Wireless Sensor

Delete the last paragraph.

918.43 Media Converter

Delete the last sentence of Paragraph (F), Part (2).

918.44 CCTV Remote Power Unit

Delete the second paragraph.

918.46 Rodent Blocking

Delete the first paragraph and replace it with the following:

The rodent blocking material shall consist of corrosion resistant rodent deterrent copper mesh capped with a pest control expandable foam that fills all voids. Duct seal is not approved material for rodent blocking.

918.47 Polymer Concrete Junction Box

Delete the first paragraph and replace it with the following:

Polymer concrete junction box Type PS shall be of configuration and dimensions as shown on the Plans.

918.48 Network Switch

Delete the last paragraph.

918.49 Coaxial Cable

Delete the first paragraph and replace it with the following:

Coaxial Cable shall consist of RG-6 cable, 18AWG solid bare copper conductors with foam polyethylene insulation, 75 Ohm characteristic impedance.

918.51 CCTV Surge Protector

Delete the Subsection in its entirety.

918.52 Variable Message Signs (VMS)

Delete the Subsection and replace it with the following:

In the context of these specifications, a VMS is a type of Dynamic Message Sign with changeable message content that is only restricted by the sign display size and density.

Pixel arrays, which dictate the size of the sign, shall be as follows, or as per Contract Drawings:

|  |  |  |
| --- | --- | --- |
| **Application** | **Pixel Array** | **Sign Dimensions** |
| General Traffic Advisory | 96x336 | 6’-9” x 22-‘-4” x 1’-0” |
| Express E-ZPass | 48x192 | 4’-8” x 13’-0” |
| Variable Speed Limit Sign, LED portion, Subsection 918.53 | 32x48 | 2’-1” x 3’-2” |
| Fixed Panel Sign Variable Insert (FPSVI) | 64 rows, columns as per Contract Drawings | As per Contract Drawings |
| Other applications | As per Contract Drawings | As per Contract Drawings |

1. VMS General Requirements

This Paragraph describes the minimum construction and operational functionality requirements for the Variable Message Sign (VMS). The VMS shall be furnished with all the materials, software licenses, and services necessary for the VMS and associated equipment that fully comply with the functional requirements specified herein, including incidental items that may have been inadvertently omitted.

The VMS shall be designed and constructed to utilize the latest available techniques with a minimum number of different parts, subassemblies, circuits, and modules to maximize standardization and commonalty. The sign shall be designed and constructed so as to present a clean neat appearance. Poor workmanship shall be cause for rejection of the sign. The performance of the sign shall not be impaired due to continuous vibration caused by wind, temperature, vibration or other factors. This includes the visibility and legibility of the display.

|  |  |
| --- | --- |
| Display Technology | High-intensity LED |
| Cabinet Access | Front or rear access, minimum, as per Contract Documents |
| Cabinet Enclosure | NEMA 3R, or NEMA 3 with all components within rated IP65, minimum. Shallow depth with front or rear accessibility for maintenance. |
| Face Panel | Exposed face modular LED boards (no mask) removable from the front or rear of the sign. |
| Face Panel Finish | Semi-Gloss Black automotive body finish |
| Housing finish | Mill Finish Aluminum |
| Weight | Per Contract Drawings |
| Dimensions | Per Contract Drawings |
| Operating Temp. Range | -30˚ F to +165˚ F (-34˚ C to +74˚ C) |
| Humidity Range | 0 to 99%, non-condensing |
| Controller Location | System Controller Cabinet |
| Display Type | Full-matrix (variable text and graphics) |
| VMS Display Modules: | Exposed face modular LED boards (no mask) removable from the front or rear of the sign. |
| VMS Pixels: | RGB pixels, 20mm pitch (distance between pixels). 60 Deg nominal viewing cone with a half power angle of 30 Deg. |
| Pixel Matrix | Per Contract Drawings |
| Pixel Pitch | 20mm (.81") |
| Viewing Distance | 1100' using 18" characters |
| Viewing Cone | 60° nominal viewing cone with a half power angle of 30° |
| Sign Intensity | 12,400 candelas/m2 minimum (white) |
| LED Color | Full color (32,000 distinct colors using red, green and blue LEDs) |
| Site Power Requirements | 120/240 VAC, single-phase power (3-wires plus ground) |
| Sign Power Requirements | 120/240 VAC, single-phase power (from System Controller Cabinet) |
| Communications Protocol | NTCIP 1203 (latest NJTA accepted version) |
| Communications Options | Cellular, fiber optic, direct Ethernet and radio Ethernet |
| Structural Design Standard | AASHTO |
| NEMA Standards | NEMA TS 4 Section 2 Environmental Requirements |

1. General Materials and Construction

Maximum overall VMS sign housing and overall sign weights shall be as per this Specification Section. The maximum criteria shall not be exceeded in order to conform to the design of the VMS sign structure.

The VMS housing shall provide access for all LED display modules, electronics, environmental control equipment, air filters, wiring, and other internal components. At a minimum, access shall be via the front or rear of the VMS as specified in the Contract Documents.

The VMS size shall be as specified in the Contract Documents

The matrix shall have a 20mm pixel pitch display capable of displaying full color messages that are continuous, uniform, and unbroken in appearance to motorists and travelers.

Each display pixel shall be composed of red, green, and blue LED’s. The pixel matrix shall be capable of displaying alphanumeric character fonts from a minimum of twelve (12) font sets with which messages can be formatted and displayed. Each font shall support up to 255 characters.

The VMS shall be able to display messages composed of any combination of alphanumeric text, punctuation symbols, and graphic images across multiple frames.

Origin

The VMS shall be final assembled in the USA. To ensure proper service, support and logistics, US-based VMS service and support personnel are required. The bidder shall certify that it will comply with the requirements of Section 1048 of the Intermodal Surface Transportation Efficiency Act of 1991 and Regulations in 49 CFR 661.

Legibility

VMS messages shall be legible within a distance range of 80 feet (24.38 m) to 1,100 feet (335.28 m) from the VMS display face under the following conditions:

* When the VMS is mounted so its bottom side is positioned between five feet and twenty feet above a level roadway surface
* Whenever the VMS is displaying alphanumeric text that is 18-inches (460 mm) high
* 24 hours per day and in most normally encountered weather conditions such as snow, rain, sun.
* During dawn and dusk hours when sunlight is shining directly on the display face or when the sun is directly behind (silhouetting) the VMS
* When the motorist eye level is 3 feet to 12 feet above the roadway surface.

Dimensions

The approximate VMS housing dimensions shall be as specified in the Contract Documents. The housing dimensions shall not exceed values shown in the NJTA Standard Drawings.

Where indicated in the Contract Drawings, the VMS shall be capable of being mounted in walk-through sign structures as shown in the NJTA Standard Drawings.

Power Requirements

The VMS shall operate from a 120/240 VAC, 60Hz, single-phase power source. Total required demand current for a single VMS and Controller Cabinet shall not exceed 50 Amps.

Sign Construction

Each VMS housing shall be constructed to have a neat, professional appearance. The housing shall protect internal components from rain, ice, dust, and corrosion in accordance with NEMA enclosure Type 3R standards, as described in NEMA Standards Publication 250 (Latest Edition), Enclosures for Electrical Equipment (1000 Volts Maximum). Alternatively, a housing meeting NEMA 3 enclosure criteria shall be acceptable where all internal components conform to a minimum IP65 rating, or a more stringent rating where required elsewhere in these Specifications. All internal and external components shall be manufactured from corrosion resistant materials.

The VMS shall be a single piece assembly consisting of all display modules, internal components, housing frame, mounting brackets, structural members, lifting provisions, and top, bottom, and side borders. The VMS shall be designed and constructed to require no field assembly prior to installation.

The VMS housing bottom side shall contain small weep holes for draining any water that may accumulate due to condensation. Weep holes and ventilation/exhaust hoods shall be screened to prevent the entrance of insects and small animals.

The VMS and sign controller components shall be capable of storage and operation without any decrease in performance over the environmental and temperature range specified in NEMA Standards Publication TS-4.

External VMS component hardware (nuts, bolts, standoffs, rivets, fasteners, etc.) shall be fabricated from hot dipped or mechanically galvanized steel, stainless steel, aluminum, nylon, or other durable corrosion-resistant materials suitable for the roadway signage application.

All external bolts, nuts, and lock washers shall be stainless steel. No self-tapping external screws shall be used. All parts shall be made of corrosion resistant materials, such as plastic, stainless steel or aluminum. All materials used in construction shall be resistant to fungus growth and moisture deterioration. Dissimilar metals shall be separated by an inert dielectric material.

VMS and sign controller components shall be 100% solid-state, except for the environmental control fans and thermostats. All high voltage electrical components (exceeding 24 VDC) used in the VMS and the sign controller shall be UL (Underwriter’s Laboratory) listed and meet all applicable NEC code requirements.

The presence of ambient radio signals and magnetic or electromagnetic interference, including those from power lines, transformers, and motors, shall not impair the performance of the VMS as specified in NEMA Standards Publication TS 4. The VMS shall not radiate electromagnetic signals that adversely affect any other electronic device, including those located in vehicles passing underneath or otherwise near the VMS and its sign controller.

Fiber optic cable communications shall be used to the extent practical between the sign and the ground mounted control cabinet in order to isolate the equipment from voltage transients and reduce the need for copper cabling.

No company logos, model numbers or text of any kind will be permitted on the outside of the sign housing.

The rear access housing dimensions and total weight of each section shall be as shown in this Specification or in the Plans. All electronic and electrical equipment compartments shall be designed and manufactured to be rain and weather tight.

All sides of the VMS housing exterior, except the front of the LED modules, shall be covered with 5052-H32 aluminum alloy sheets with a minimum thickness of 0.090” (2.286 mm). This external aluminum skin may be attached to the structural framework using a proven chemically bonding structural adhesive. The VMS housing structural frame shall be constructed of 5052-H32 aluminum alloy members. The structural framework members may be permanently attached to each other using a proven chemically bonding structural adhesive.

The sign housing shall be engineered and Professional Engineer certified to 2001 AASHTO and NCHRP Report 411 specifications for AASHTO basic wind speeds. The sign housing shall also be engineered and Professional Engineer certified to withstand loading combinations as outlined in 2001 AASHTO including: sign weight, ice and wind loads, and shall also meet strength requirements for truck-induced gusts as specified in NCHRP Report 412. The sign housing shall be engineered and Professional Engineer certified to withstand snow loading (40 PSF) for applicable geographical regions.

The VMS housing’s right, left, front and rear exterior walls shall be vertical. The top and bottom walls shall be horizontal. LED display modules shall be mounted parallel to the front wall so the legible LED viewing area is optimized.

VMS structural assembly hardware (nuts, bolts, washers, and direct tension indicators) shall be stainless steel or galvanized A325 high-strength steel and shall be appropriately sized for the application.

Exterior mounting assemblies shall be stainless steel or galvanized ASTM A 709, Grade 50 structural angles.

The VMS housing for each type of VMS shall be designed and fabricated to fit within the appropriate VMS structure as depicted in the NJTA Standard Drawings

1. Chemical Bonding

The external aluminum sheets may be attached to the cabinet frame members using a two-part chemically bonding structural adhesive. The adhesive shall be applied in a continuous bead on all cabinet frame surfaces that contact the aluminum sheet. The adhesive shall ensure a watertight seal is obtained around the entire perimeter of the cabinet and where any aluminum sheets are spliced.

To ensure that appropriate procedures are followed to bond the aluminum sheet and cabinet frame members, the structural adhesive manufacturer shall certify the VMS manufacturer’s adhesive application process. The VMS Manufacturer is responsible for performing all necessary testing of the adhesive to meet all requirements of the contract specifications.

1. Welding

If welding is selected by the manufacturer over chemical bonding, the minimum sheet thickness of the exterior panels shall be 0.1 inches.

The aluminum skin shall be welded to the VMS cabinet frame. All exterior sheet seams shall be continuously seam welded to the VMS frame to form a single structure. Stitch welding shall be used on the interior of the cabinet to attach the aluminum skin sheets to the aluminum extrusion frame.

All welding shall be by an inert gas process in accordance with the American Welding Society (AWS) Standards, 2008 ANSI/AWS D1.2/D1.2M Structural Welding Code for Aluminum. The VMS manufacturer’s welders and welding procedures shall be certified by an ANSI/AWS Certified Welding Inspector to the 2003 ANSI/AWS D1.2/D1.2M Structural Welding Code for Aluminum.

Seams that separate adjacent LED display modules shall be sealed. LED display modules shall not be welded to the VMS housing.

The VMS manufacturer shall submit documentary evidence and complete reference data for the above requirements. Reference data shall include the name and address of the welding organization, and the name and telephone number of an individual from the organization who can be contacted to verify the above requirements and all the details required to support the above requirements.

The Authority reserves the right to contact additional references. Any poor or unsatisfactory reference, as determined by the Authority in its sole and absolute discretion, will cause the manufacturer to be rejected.

Mounting Brackets and Miscellaneous Materials

Multiple mounting brackets in the form of steel angles, as shown on the NJTA Standard Drawings, shall be bolted to the VMS housing exterior to facilitate attachment of the VMS to the support structure. Mounting brackets shall be:

* Stainless steel or galvanized ASTM A 709, Grade 50 structural steel
* Attached to the VMS structural frame members, not just the exterior sheet metal
* Installed at the VMS Manufacturer’s factory
* Attached to the VMS using mechanically galvanized A325 high-strength stainless steel bolts, washers, and lock washers
* Attached to the VMS using direct tension indicators to verify that mounting hardware is tightened with the proper amount of force
* Installed such that all bracket-to- VMS attachment points are sealed and water-tight
* Designed and fabricated such that the installing contractor can drill into them, if required, without penetrating the VMS housing or compromising the housing’s ability to shed water

The VMS Manufacturer shall supply neoprene pads, of the dimensions shown on the Plans, used to support the bottom of the sign. The pads shall be either virgin neoprene (polychloroprene) or virgin natural rubber (polyisoprene). The elastomer compound shall be temperature grade 3 and 60 durometers.

The VMS Manufacturer shall design the bolted connection used on the steel angle mounting brackets to support the VMS sign and connect to the plates on the VMS support structure. The VMS Manufacturer shall drill the holes in the mounting brackets per its design. The VMS Manufacturer shall supply the required galvanized A325 high strength bolts, nuts and washers needed to make these connections.

Lifting Hardware

For moving and installation purposes, multiple galvanized steel lifting eyebolts, or some other lifting configuration shall be attached to the VMS housing. Lifting hardware shall attach directly to the VMS housing structural frame and be installed at the VMS factory. All mounting points for eyebolts shall be sealed to prevent water from entering the VMS housing. Lifting hardware, as well as the housing frame, shall be designed such that the VMS can be shipped and handled without damage or excessive stress being applied to the housing prior to or during VMS installation on its support structure.

The lifting eyebolts shall be easily removed by one individual without opening or entering the display and without any risk of compromising water-tightness. Special tools shall not be required. Removal of the eyebolts shall not create holes and no replacement bolts or other hardware shall be necessary to seal the cabinet. In addition, it shall not be required to remove the eyebolts or alternate lifting hardware, should this material fit within and be useful for future removal of the VMS from the support structure.

The hardware used to attach the mounting brackets (nuts, bolts, washers, and direct tension indicators) to the VMS cabinet shall be stainless steel and shall be appropriately sized for the application.

Exterior Finish

The VMS sign portion front face panels and front face border pieces shall be coated with semi-gloss black automotive body grade fluoropolymer coating, with an expected outdoor service life of 20 years.

All other VMS housing surfaces, including the access doors, shall be natural mill-finish aluminum.

Service Access

The VMS housing shall provide, at a minimum, front or rear access for all maintenance operations as indicated in the Contract Documents. The VMS housing shall provide safe and convenient access to all modular assemblies, components, wiring, and subsystems located within the VMS housing. All of those internal components shall be removable and replaceable by a single technician.

Access doors shall be provided for each section of a rear or dual access sign housing. One door shall also be provided for accessing the load center and sign control electronics. It shall be possible to remove and replace all components in a rear or dual access sign from the rear access doors without first having to remove multiple interfering components. All cable assemblies, ventilation ducts, and door partitions shall be assembled and placed to minimize interference with the removal and replacement of internal components.

The doors shall be restrained to prevent them from falling off or blowing around in the wind when in the open position. The doors shall not interfere with the mounting when in the open or closed position.

When in the open position, the doors shall not obstruct any portion of the opening. Ventilation hoods and closed doors shall not obstruct the opening of any door. The doors shall not interfere with the flow of air through the ventilation hoods.

Each door shall contain screw-type quarter-turn latches. A tamper resistant key shall be used for activating the latches. All latches shall be keyed alike. Two keys shall be provided with each sign delivered. The latches shall pull the door tight and compress a gasket located around the perimeter of each door. The gasket shall prevent water from entering the cabinet.

Environmental Behavior

The VMS shall be capable of operating without any decrease in performance over a temperature range as required under NEMA Standards Publication TS 4 (with a relative humidity of up to 100% condensing) unless otherwise noted in this specification.

Wiring and Power Distribution

1. Power and Signal Entrances

The sign and its sign controller shall be capable of operating from 120/240 VAC, with a maximum of 50 Ampere service, 60 Hertz, single-phase power. Two threaded conduit hubs shall be located on the rear wall of the VMS housing. One hub shall be for incoming AC power and the other shall be for incoming VMS signal cabling or a communications line.

1. Panel Board

The VMS shall contain a power panel board or DIN rail mounted circuit breakers that meet the following minimum requirements:

• Service entrance-rated

• Short circuit ratings of 22,000 Amps and 10,000 Amps for the main and branch circuits, respectively

• UL listed panel boards and circuit breakers

1. Internal Wiring

All wiring and electrical equipment shall be in accordance with the requirements of the National Electrical Code. Wiring shall be neatly arranged, bundled, and mechanically supported. Wiring shall not impede the removal of display modules, power supplies, environmental control equipment, and other sign components. Wires shall not make contact with or bend around sharp metal edges. The use of adhesive-backed, surface-mount wiring clamps shall not be permitted.

All internal wire terminations shall be made at appropriately rated terminal blocks or connectors. Crimp type terminals shall be affixed with a cycle-controlled crimp tool that will not permit a crimp to be made without the proper degree of compression. All terminal blocks shall be clearly labeled with terminal numbers. All wires shall be individually labeled at terminal points with a machine printed flexible tape or another professional means designed specifically for wire labeling.

1. Earth Grounding

The VMS manufacturer shall provide one earth ground lug that is electrically bonded to each section of the VMS housing. The lug shall be installed near the power entrance location on the VMS housing’s rear wall. The VMS installation contractor shall provide the balance of materials and services needed to properly earth ground the VMS. All earth grounding shall conform to the National Electrical Code.

Transient Protection

The VMS and sign controller signal and power inputs shall be protected from electrical spikes and transients as follows:

1. Sign AC Power

The AC power feed for all equipment in the sign cabinet shall be protected at the panel board by a parallel-connection surge suppresser rated for a minimum surge of 40 KA. This device shall conform to the following requirements:

• Withstand a peak 80,000-Ampere surge current, 40kA L-N, 40kA L-G

• Designed, manufactured, & tested consistent with: IEEE C6.41.1-2002, C62.41.2-2002, C2.45-2002, ANSI/IEEE C62.41-1991, C62.45-1992, NEMA LS-1, and NEC 285.6

• Less than 0.5 nanosecond response time

• Temperature range as specified in NEMA Standards Publication TS 4

• 5000 Category (C3 High) impulses with <10% drift, short circuit current rating of 200,000 rms symmetrical Amperes (UL Listed)

• UL listed to: UL 1449 200kA SCCR, UL 1283 4th Edition, and Canadian safety standards

1. Communication Lines

All copper cable communication lines shall be protected by transient suppression devices as appropriate for the type and operating voltage of the communication line. Communication line transient suppression devices shall be equipped with modular connectors for ease of replacement and shall electrically bonded to ground with a heavy gauge ground wire kept as short and straight as practical.

LED Display Modules

The VMS front face shall be constructed of multiple LED display modules, each of which shall support and protect an array of LED pixels. The LED display modules shall be placed adjacently in a two-dimensional matrix to form the face of the VMS. Each display module shall be constructed as follows:

* Each LED display module shall have a cam latch(es) that fasten it to the VMS housing. Latching mechanisms shall be actuated by a quarter-turn latching points on the front face of each LED display module. It shall be possible to activate the latches from both the front and back of each module. The module latches shall be actuated by a standard hex key wrench.
* The LED display modules shall be sealed to a minimum of IP67 standards.
* LED display modules shall not be welded to the VMS housing.
* Front face LED display modules shall provide a high-contrast background for the VMS display matrix. The front of each LED display module shall be black and contain high-contrast plastic masking for the LED pixels.
* Removal of the LED modules shall be from the interior of a rear access or dual access VMS housing. All LED display modules and internal components shall be removable and replaceable by a single technician. For a rear or dual access VMS, the LED module shall be unlatched, removed and pulled back through the opening in which it covered. All VMS modules shall be secured to the sign housing with a quick release lanyard or tether to prevent the modules from becoming dislodged from the VMS during the removal and replacement process.
* In the presence of wind, rain and snow, the VMS front face shall not distort in a manner that adversely affects LED message legibility.
* Each LED display module shall contain no more than one circuit board to minimize electrical connections. All LED modules shall be manufactured using laminated fiberglass printed circuit boards with conformal coating to minimize environmental corrosion.
* The LED pixels in the module shall be protected by a black contrast-enhancing silicone elastomer that surrounds the base of the LEDs and seals the entire front face of the module to prevent water penetration and corrosion, while not obstructing the viewing angles of the LEDs.
* LED display module electrical connections shall use a quick-disconnect locking connector. Removal of an LED display module from the VMS shall not require a soldering operation.
* It shall not be possible to mount a display module upside-down or in an otherwise incorrect position within the VMS display matrix.
* All LED display modules shall be identical and interchangeable throughout the VMS.
* Removal or failure of any LED module shall not affect the operation of any other LED module or sign component. Removal of one or more LED modules shall not affect the structural integrity of any part of the sign.
* Each LED display module shall contain a minimum of 256 LED pixels configured in a two-dimensional array. The pixel array shall be a minimum of 16 pixels high by 16 pixels wide.
* The distance from the center of a pixel to the center of each adjacent pixels, both horizontally and vertically, shall be 0.78 inches (20mm).
* All pixels shall contain an equal quantity of LED strings.
* The failure of an LED string or pixel shall not cause the failure of any other LED string or pixel in the VMS.
* Each pixel shall contain the quantity of discrete LEDs needed to output white colored light at a minimum luminous intensity of 12,400 candelas per square meter when operated within the forward current limits defined in these specifications.
* The circular base of the discrete LEDs shall be soldered so that they are parallel to the surface of the printed circuit board. The longitudinal axis of the LEDs shall be perpendicular to the circuit board.

Discrete LEDs

VMS pixels shall be constructed with discrete LEDs manufactured by Avago Technologies (formerly Agilent Technologies), Toshiba Corporation, Nichia Corporation, OSRAM, or approved equivalent. Discrete LED’s shall conform to the following specifications:

* All LED’s shall have a minimum unimpeded viewing cone of 60 degrees with a half-power angle of 30 degrees measured from the longitudinal axis of the LED.
* Red, green and blue LEDs shall be able to produce colors that will meet NEMA Standards Publication TS 4 Section 5.5.1 requirements for chromaticity.
* The LED manufacturer shall perform color sorting of the bins. Each color of LEDs shall be obtained from no more than two (2) consecutive color “bins” as defined by the LED manufacturer.
* The LED manufacturer shall perform intensity sorting of the bins. Each color of LEDs shall be obtained from no more than two (2) consecutive luminous intensity “bins” as defined by the LED manufacturer.
* The various LED color and intensity bins shall be distributed evenly throughout the sign and shall be consistent from pixel to pixel. Random distribution of the LED bins shall not be accepted.
* The LED package styles shall be through-hole with standoffs.
* All LEDs used in all VMS provided for this contract shall be from the same manufacturer and of the same part number, except for the variations in the part number due to the intensity and color bins.
* The LEDs shall be rated by the LED manufacturer to have a minimum lifetime of 100,000 hours of continuous operation while maintaining a minimum of 70% of the original brightness.

Pixel Drive Circuitry

Each LED display module shall contain electronic driver circuitry that shall individually control all pixels on that module. The driver circuitry shall conform to the following specifications:

* LED driver boards shall be manufactured using a printed circuit board.
* Each LED driver board shall be microprocessor-controlled and shall communicate with the sign controller on a wire or fiber optic communication network using an addressable network protocol. The microprocessor shall process commands from the sign controller to display data, perform diagnostic tests, and report pixel and diagnostic status.
* Constant current LED driver ICs or another method that provides at least the same level of control (such as PWM) shall be used to prevent LED forward current from exceeding the LED manufacturer’s recommended forward current whenever a forward voltage is applied. To maximize LED service life, LED drive currents will not be allowed that exceed the manufacturer’s recommendations for the 100,000-hour lifetime requirement.
* The LED pixels shall be directly driven using pulse width modulation (PWM) of the drive current to control the display intensity. This LED driver circuitry shall vary the current pulse width to achieve the proper display intensity levels for all ambient light conditions. The drive current pulse shall be modulated at a frequency high enough to provide flicker-free operation and a minimum of 200 brightness levels.
* The LED driver circuitry shall receive updated display data at a minimum rate of two (2) frames per second from the sign controller.
* Each LED driver circuit shall be powered by 24 VDC from external regulated DC power supplies. This input voltage shall be fused. Each driver board shall receive power from a minimum of two (2) independent power supplies. Indicator LEDs shall be provided to indicate the status of various voltage levels on the board.
* The voltage of each power input shall be measured to the nearest tenth of a volt and reported to the sign controller upon request. Each driver circuit shall also contain one status LED for each power source that indicates if the power source is present or not.
* The LED driver circuitry shall be able to detect that individual LED strings or pixels are stuck on or off and shall report the pixel status to the sign controller upon request.
* The LED driver circuit shall contain a LED display that indicates the functional status of the driver and pixel boards. At a minimum, it shall indicate error states of the LED pixels and communication network. The indicator shall be positioned such that a maintenance technician can easily view the status code for diagnostic purposes. The status codes shall also be reported to the sign controller upon request.
* Removal or failure of a single driver circuit board shall not affect the performance of any other LED display module in the VMS.
* Individual addressing of each driver circuit shall be configured via the communication wiring harness or module position. No on-board addressing jumpers or switches shall be allowed.

Regulated DC Power Supplies

The LED pixel display modules shall be powered with auto-ranging regulated switching power supplies that convert the incoming AC to DC at a nominal voltage of 12, 24, or 48 Volts DC. Power supplies shall be wired in a redundant parallel configuration that uses multiple supplies for the VMS display matrix.

Power supplies shall be designed to provide redundancy within the display to ensure continued operation under a failure of a single power supply. Power supplies shall be redundant and rated such that if one supply fails, the display shall be able to operate 100% of the pixels in that display region at 100% brightness when the internal VMS air temperature is +140ºF (60ºC) or less.

Each power supply within each redundancy pair shall receive 120VAC power from separate circuits on separate circuit breakers, such that a single tripped breaker will not disconnect power from both supplies. It shall be acceptable for a single circuit breaker to power multiple DC power supplies provided that none of those power supplies are in the same power supply pair.

The power supplies shall be sufficient to maintain the appropriate LED display intensity throughout the entire operating input voltage range.

The output of each power supply shall be connected to multiple circuits that provide power to the LED modules. Each output circuit shall not exceed 15 Amperes.

Each power supply shall be monitored by a microprocessor-controlled circuit. This circuit shall monitor the voltage of each power supply and the status of each output circuit’s fuse. The power supply voltages and fuse states shall be reported via a communication network to the sign controller and reported to Central by the sign controller.

The power supplies used to power the LED pixel modules shall be identical and interchangeable throughout the VMS.

Regulated DC power supplies shall conform to the following specifications:

* Nominal output voltage of 12, 24, or 48 VDC +/- 10% unless otherwise approved
* Operating input voltage range shall be a minimum of 90 to 260 VAC
* Operating temperature range shall be as specified in NEMA Standards Publication TS 4
* Maximum output power rating shall be maintained over a minimum temperature range as specified in NEMA Standards Publication TS 4.
* Power supply efficiency shall be a minimum of 80%
* Power factor rating shall be a minimum of 0.95
* Power supply input circuit shall be fused
* Automatic output shut down if the power supply overheats or one of the following output faults occurs: over-voltage, short circuit, or over-current
* Maximum allowable power supply weight shall be 15 pounds.
* Power supplies shall be UL listed
* Printed circuit boards shall be protected by a silicone conformal coating

Control Systems

The VMS shall be controlled from primary and auxiliary locations in compliance with Subparagraph 918.52(B)(18) of these specifications.

Environmental Monitoring Systems

The VMS shall include sensors that monitor and report ambient (external) light level and temperature, as well as the internal temperature.

1. Ambient Light Measurement

Sensors that measure the outdoor ambient light level at the VMS site shall be mounted in-line with the VMS housing walls. This ambient light measurement system shall consist of two (2) electronic light sensors. The light sensors shall be placed such that they measure the ambient light levels striking the front and rear of the VMS. The VMS sign controller shall continuously monitor the light sensors and adjust the LED display matrix intensity to a level that creates a legible message on the VMS face. The VMS shall allow for remote adjustment of the light sensor measurement to display intensity table from the central server software.

1. Ambient Temperature Measurement

A minimum of one (1) ambient temperature sensor shall be mounted to either the rear wall or bottom side of the VMS housing. An ambient outdoor temperature sensor shall be placed such that it is never in direct contact with sunlight. The external temperature sensor reading shall be continuously monitored by the VMS sign controller and shall be reported to the VMS control software upon request.

1. Internal Temperature Measurement

The VMS shall contain a minimum of two (2) temperature sensors that are mounted near the top of the VMS interior. The temperature sensor(s) shall measure the temperature of air in the cabinet over a minimum range from -40°F to + 176°F (-40°C to 80°C). The temperatures from the sensors shall be continuously measured and monitored by the sign controller. A temperature reading greater than a user selectable critical temperature shall cause the sign to go to blank and the sign controller shall report this action to the central controller. This user selectable critical temperature shall be capable of being changed by the central controller or laptop computer. The central controller and laptop computers shall have the ability to read temperature measurements from the sign controller. The internal temperature sensor’s outputs shall be continuously monitored by the VMS sign controller and shall be reported to the VMS control software upon request.

Interior VMS Environmental Control

The VMS shall contain systems for cabinet ventilation and safe over-temperature shutdown.

1. Housing Ventilation System

The VMS housing shall contain a thermostatically controlled ventilation system designed to keep the internal VMS air temperature lower than +140°F (+60°C), when the outdoor ambient temperature is +115°F (+46°C) or less.

Cooling fans shall be the ball-bearing type and shall be mounted in a line across the rear of the VMS housing wall. One fan at a minimum shall be installed per each exhaust port. Intake ports shall be located in a line across the rear VMS wall.

Each ventilation fan shall contain a sensor to monitor its rotational speed, measured in revolutions per minute. The fan speed shall be reported via a communication network to the sign controller upon request. Alternatively, the ventilation system status may be monitored by airflow sensors in-line with the ventilation air stream. The airflow sensors shall be sufficiently dampened to prevent oscillations and false indications.

An aluminum hood or louvers attached to the rear wall of the VMS shall cover each air intake and exhaust port. Openings shall be screened to prevent the entrance of insects and small animals. All intake and exhaust ports shall be designed to prevent blowing rain from entering the VMS.

1. Over Temperature Safety Shutdown

The VMS controller shall automatically shut down the LED modules to prevent damaging the LED’s if the measured internal cabinet air temperature exceeds a maximum threshold temperature. The threshold temperature shall be configurable and shall have a default factory setting of 140°F (+60°C).

Sign Controller Signal Interface

Communication signals from the sign controller in a ground-mounted controller cabinet to the VMS shall use redundant fiber optic cables. Each VMS shall have two (2) duplex fiber optic communication ports for connection to the sign controller. A failure of either communications port or fiber optic cable shall not interrupt communications through the other communications port. It shall also be possible to connect multiple VMS to a single controller in a ring configuration using the redundant communication ports.

The VMS fiber optic cable shall comply with the following specifications:

* 62.5/125 or 50/125 μm diameter multi-mode fibers
* ST, SC, or LC style connectors to match style of controller connector
* Rated for indoor/outdoor use
* UL-rated
* PVC outer jacket
* Tight buffer inner jacket
* Operating temperature range: as specified for the sign and outdoor equipment.

The Contractor shall furnish and install fiber optic cable for connection to the ground-level control cabinet. A minimum of six (6) fibers shall be provided with one (1) for controller to sign commands, one (1) for sign to controller responses, and four (4) spares. All fiber strands, whether used or spare, shall be terminated at both ends by the installer. The fibers shall terminate in a mounted termination panel or connectorized block at both ends and shall be connected to the sign controller and sign interface by way of flexible and durable fiber optic patch cords.

1. VMS Controller

This Paragraph describes the minimum specifications for the VMS controller. Each VMS shall include a sign controller, and associated equipment. The VMS Manufacturer shall provide all the materials, software, and services necessary to install VMS controllers and associated equipment that fully comply with the functional requirements specified herein, including incidental items that may have been inadvertently omitted.

1. General Requirements

The sign controller shall meet the following operational requirements:

* Communicate using the NTCIP v2 protocol or later.
* Contain memory for storing changeable and permanent messages, schedules, and other necessary files for controller operation.
* Include a front panel user interface with an LCD display, or equivalent, and a keypad for direct operation and diagnostics as described herein.
* Contain a minimum of two (2) NTCIP–compliant RS232 communication ports with DB9 connectors.
* Contain a minimum of two (2) NTCIP-compliant Ethernet ports with RJ45 connectors
* Contain firmware (embedded software) that shall monitor all external and internal sensors and communication inputs and control the display modules as directed by external control software and the front panel interface. NTCIP shall be natively supported in the VMS controller. External protocol converter or translator devices are not allowed.
* All control capability required for each VMS site shall fit within the space available within the System Control Cabinet (SCC) specified in Specification Subsection 918.19.

Controller Location

The primary sign controller and associated communication equipment may be installed inside the SCC. Auxiliary control capability shall be installed as needed to provide local access to the controller from both the SCC and sign enclosure. Auxiliary control capability shall be included as specified in Subparagraph 918.52(B)(17).

Environmental

The sign controller shall meet the environmental requirements defined in NEMA Standards Publication TS 4, Hardware Standards for Dynamic Message Signs (DMS), with NTCIP Requirements.

Sign Controller Functions

The sign controller shall be controlled from the Authority’s existing Central Controller or a laptop computer, which shall specify the appropriate display. The sign controller shall be capable of controlling multiple LED VMS signs. The sign controller and its software shall perform the following functions:

* Display a message
* Report errors and failures, including:

(1) Data Transmission error

(2) Receipt of invalid data

(3) Communications failure recovery

(4) VMS component failure (VMS pixel error, power supply failure, etc.)

(5) Power recovery

* Message and status monitoring:

The sign controller shall transmit a return message to the Central Controller whenever it receives a valid transmission requesting sign status. The return message shall contain the following:

(1) Address or ID of the sign

(2) Message that is actually displayed.

(3) Message source information (Central, Local, etc.)

(4) Device error codes

(5) Uninterruptible power supply status

* Severe error condition response:

The sign controller shall report severe error conditions to the central controller. The severe error conditions are:

(1) AC power failure.

(2) AC power recovery.

(3) Surge protection has been tripped

* Communication Failure

In the event the central controller fails to communicate within a programmable time limit with the sign controller, the sign shall respond per the requirements of NTCIP. This function shall apply only when the sign controller is in central control mode.

* Sign Failure

Failure of any sign shall not affect the operation of any other sign in the system.

* Power Failure

The sign controller shall maintain its internal time clock during power outages less than 255 minutes and display the proper message when power is restored.

* Remote Reset

The sign controller shall be capable of being remotely reset from the

Operational Requirements

1. Front Panel User Interface

The sign controller’s front panel shall include a keypad and LCD. These devices shall be used to perform the following functions with the sign controller and VMS:

• Monitor the current status of the VMS, including the status of all sensors and a what-you-see-is-what-you-get (WYSIWYG) representation of the message visible on the LED VMS display face.

• Perform diagnostics testing and monitoring of various system components, including pixels, power systems, sensors, and more.

• Activate LED VMS messages stored in memory.

• Configure display parameters, including display size and colors.

• Configure communications port settings and NTCIP options.

The front panel interface shall also include:

• Power switch to turn the controller on and off.

• “Local/remote” switch that places the controller in local mode such that it can be controlled from the front panel interface, instead of via the primary NTCIP communication channel.

• Reset switch to quickly restart the controller.

1. Memory

The sign controller shall have non-volatile electronically changeable memory. This memory shall be formed by flash or battery-backed static RAM integrated circuits that retain the data in memory indefinitely following a power loss. This changeable memory shall be used to store messages and schedules. The controller memory shall be capable of storing a minimum of 100 changeable messages in non-volatile RAM.

1. Internal Clock

The VMS sign controller shall contain a computer-readable clock that has a battery backup circuit. The controller shall allow for connection to a Network Time Protocol (NTP) sever for synchronization of the internal clock.

Communications

All remote communication ports shall be NTCIP-compatible as defined in the “Requirements for NTCIP Compatibility” section of these specifications.

1. Communication Mode

The VMS sign controller shall be able to receive instructions from and provide information to a computer containing VMS control software using the following communication modes:

• Remotely via direct, fiber, or wireless communications with a remotely located computer. The system communications backbone, as well as all field modems or signal converters, will provide the VMS sign controller with an Ethernet signal.

• Locally via direct connection with a laptop computer that is connected directly to the sign controller using any of the following connections: RS232, USB, or Ethernet.

1. Serial Communication Port

The VMS controller shall contain a minimum of one (1) serial communication port. This port shall support a direct communication interface for local laptop control using either a DB9 or USB connector.

The baud rate, connection type, and NTCIP communication protocol shall be configurable. The port must support all typical serial baud ranging from 1200 to 115,200 baud. The port shall be capable of supporting the NTCIP 2103 (PPP), NTCIP 2201 (Null), and NTCIP 2202 (Internet) transport profiles. Only one of each of the transport and sub network profiles shall be active at any time on the port.

1. Ethernet Port

The VMS controller shall contain a minimum of one (1) 10/100Base-T Ethernet communication port for communicating from the central control system to the VMS sign controller. The Ethernet port shall have a standard RJ45 connector.

Communications on the Ethernet port shall be NTCIP-compatible using the NTCIP 2202 Internet transport profile and the NTCIP 2104 Ethernet sub network profile. This shall permit the controller to be operated on any typical Ethernet network using the TCP/IP and UDP/IP protocols.

1. Controller Addressing

The VMS controller shall use the NTCIP 2104 (Ethernet) network protocol with a static v4 IP address. Both the IP address and subnet shall be configurable. The controller addressing shall be configurable through the front panel user interface.

1. Transient Protection

The serial and Ethernet communication ports in the VMS controller shall be protected with surge protection between each signal line and ground. This surge protection shall be integrated internally within the controller.

VMS Control Outputs

VMS sign controller(s) located in the ground level SCC shall transmit and receive data packets to and from the VMS via redundant dedicated fiber optic cables. The controller shall communicate with all sensors, drivers, and other devices utilizing a bus network running throughout the VMS.

Data transferred shall include pixel control and monitoring, values, and I/O readings from various devices, such as door sensors and power supply monitors. Pixel data shall include the states to be displayed on the sign face as well as diagnostic data retrieved from the LED drivers.

Adequate surge protection shall be installed to mitigate the effects of spikes that result from motor operation and all other sources.

Messaging

The VMS controller shall have the ability to display messages on the VMS display face as required herein.

1. Message Presentation on the VMS Display Matrix

The sign controller shall control the LED drivers in a manner that causes the desired message to display on the VMS sign. At a minimum, the sign controller shall support the following features as described in the VMS specification:

• Display of alpha numeric characters, including letters, numbers, and punctuation.

• Selection of particular character font’s style.

• Horizontal alignment of text on the display, including left, center, and right justification.

• Vertical alignment of text on the display, including top, middle, and bottom justification.

• Adjusting the spacing horizontally between characters or vertically between lines of text.

• Alternating between pages of a multiple-page message.

• Display of graphic bitmaps of various sizes ranging from very small to the size of the entire VMS matrix.

• Simultaneous display of character fonts over graphic images.

1. VMS Message Effects

The VMS shall be able to display messages using the following types of effects:

• Static Message – The selected message is displayed continuously on the face until the sign controller blanks the sign or causes the display of another message.

• Flashing Message – All or part of a message is displayed and blanked alternately at rates between 0.1 seconds and 9.9 seconds. The flash rate is user programmable in increments of 0.1 seconds.

• Scrolling Message – The message moves across the display face from one side to the other. The direction of travel is user selectable as either left-to-right or right-to-left.

• Multiple-Page Message – A message contains up to six different pages of information, with each page filling the entire pixel matrix. Each page’s display time is user programmable from 0.1 seconds to 25.5 seconds, and adjustable in increments of 0.1 seconds.

Message Activation

Messages shall be activated on the VMS in three ways:

* Manual – An operator using the controller front panel LCD/keypad interface or NTCIP-compatible control software manually instructs a particular message to be activated.
* Schedule – The internal time-based scheduler in the controller may be configured to activate messages at programmable times and dates. Prior to activation, these messages and their activation times and dates shall be configured using the control software. (Alternatively, schedules may be stored and managed in the central controller).
* Events – Certain events, such as a communication or power loss, shall trigger an event response when they occur. These events shall be configured using the control software. Configurable event responses shall include the ability to blank the sign, post a pre-configured default message, or retain the existing message display.

A displayed message shall remain on the sign until one of the following occurs:

* The message’s duration timeout expires.
* The controller receives a command to change the message.
* The controller receives a command to blank the sign.
* The schedule stored in the controller’s memory (or stored and managed in the Central controller) indicates that it is time to activate a different message.
* A special event, such as a loss of communication, occurs that is linked to message activation.

It shall be possible to confer a “priority” status onto any message, and a command to display a higher priority message shall cause any lower priority message to be overridden.

Schedule Activation

The VMS sign controller shall support the activation of messages based on a time/date-based schedule, stored either in the sign controller, or in the Central controller). The format and operation of the message scheduler shall be per the NTCIP 1201 and NTCIP 1203 standards.

Display of Alphanumeric Text

* The VMS sign controller shall support the storage and use of a minimum of twenty (20) font sets with which messages can be formatted and displayed. Each font shall support up to 255 characters. All text font files shall include the following characters:
* The letters “A” through “Z”, in both upper and lower case
* Decimal digits “0” through “9”
* A blank space
* Eight (8) directional arrows
* Punctuation marks, such as: . , ! ? – ‘ ’ “ ” : ;
* Special characters, such as: # & \* + / ( ) [ ] < > @
* The VMS Manufacturer shall provide the VMS controller with the following fonts preinstalled. The controller shall support changing or replacing these fonts from the central software using NTCIP. All font characters are variable width except where indicated otherwise.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Pixel Array | **Character Height (approx.)** | **Character Width (avg.)** | **Stroke Width (pixels)** | **Comments** |
| 20x12 | 16” | 9.5” | 3 | Small |
| 20x16 | 16” | 12.5” | 4 | Small – MUTCD \* |
| 23x15 | 18” | 12” | 3 | Standard |
| 23x15 | 18” | 12” | 3 | Standard, fixed width |
| 23x17 | 18” | 13.5 | 3 | Standard, wide |
| 23x19 | 18” | 14” | 4 | Standard – MUTCD \* |
| 24x15 | 19” | 12” | 3 | Tall |
| 24x15 | 19” | 12” | 3 | Tall, fixed width |
| 24x19 | 19” | 15” | 4 | Tall – MUTCD \* |

* \* Note: Fonts commented as “MUTCD” in the table above shall be made to simulate the appearance and size requirements of the Manual on Uniform Traffic Control Devices (MUTCD) and the “Standard Highway Signs and Markings” (SHSM) Book for Series E-Modified text characters.

Display of Graphic Images

* The VMS control software shall support the inclusion of graphics in messages in accordance with NTCIP 1203 v2. The VMS may support graphics that exceed current NTCIP limitations by using manufacturer specific MIB objects and MULTI tags.

VMS Intensity Control

* The VMS controller shall provide a means to change the brightness of the display matrix manually or automatically. The manual control will allow the user to select one of at least 100 intensity levels, which will be communicated to the LED drivers in the VMS. The brightness shall remain at that level until the user changes the level or sets the controller to automatic mode.
* The automatic intensity control mode shall monitor the ambient light sensors of the VMS and use a mathematical algorithm to automatically select one of 100 or more intensity levels. The intensity level shall then be transmitted to the LED drivers in the VMS. The controller shall allow the adjustment of display intensity settings under various lighting conditions remotely from the central control software.
* The intensity control mode, manual or automatic, shall be settable via NTCIP using the control software and via the front panel interface. The manual brightness level shall be settable via the software and front panel. The mode and brightness level shall be monitored from both the software and front panel interfaces.

Permanent Messages

* VMS controller(s) shall have the ability to store and activate NTCIP compliant permanent messages. A software utility or other means shall be provided to remotely download permanent message and support files to the VMS controller. It shall also be possible to download changeable messages from the central server, store them in the VMS controller, and display them on the sign.

System Status Monitoring and Diagnostic Testing

* The VMS controller shall be capable of monitoring the status of many of the VMS components and subsystems in real-time and/or manual modes, depending on the component or system. The following sections detail the status and diagnostic information that shall be provided by the controller. All of this status and diagnostic data shall be available via the front panel LCD screen and shall be transmitted via NTCIP to control software upon request.

1. Message Display Status

The VMS controller shall be capable of monitoring and displaying the currently active VMS message (if any) on the controller’s front panel LCD display. This display shall be in a WYSIWYG (What You See Is What You Get) format. What is viewed on the VMS control computer monitor shall be a scaled representation of how a message will appear when it is being displayed on the VMS. Similarly, after a pixel diagnostic test routine has been run, what you see on the control computer monitor shall be a scaled representation of the functional status of each pixel in the VMS display matrix. This term does not refer to methodologies called “WYSIWYG” (or similar), that simply simulate what is being displayed on a VMS (such as, for example, by not directly monitoring the electrical current flowing through each string of LED’s in all LED pixels).

1. LED Pixel Testing

Upon command from either the front panel control interface or via NTCIP from remote control software, the sign controller shall direct all of the LED modules to perform diagnostic tests of all their pixels. The controller shall then collect and report the results of the pixel testing.

The controller shall also be capable of automatically detecting in real-time the status of each of the display’s pixels and reporting their on/off status. This monitoring shall take place without interfering with the display of data on the VMS face.

1. Power Supply Operation

The sign controller shall monitor and report the functional status of all regulated DC power supplies located in the VMS by monitoring diagnostic outputs located on the supplies. The controller shall monitor the output voltage of each power supply and the status of each output fuse. The power supply voltages shall be measured to the nearest tenth of a volt and the fuse status shall be indicated as pass or fail.

1. Fan or Ventilation Operation

The controller shall monitor the status of the fans using a tachometer integrated into each fan and report the status back to the central controller. Alternatively, the controller shall monitor the airflow in the ventilation system and report the status back to the central controller.

1. Door Status

The VMS controller shall monitor the status of all System Control Cabinet and VMS doors. The sign controller shall report the open or closed door status back to the central controller.

1. Environmental Conditions

The VMS controller shall monitor and report the readings of all light, temperature, and humidity sensors installed in the VMS housing. The VMS controller shall also monitor and report the internal temperature of the sign controller.

Error Notification

* The VMS sign controller shall be capable of automatically informing a maintenance operator (via the local LCD panel) and the central control system (via NTCIP communication) of the occurrence of important events and subsystem failures.
* All major component and subsystem errors shall be indicated on the controller’s LCD front panel.
* The controller shall be capable of sending event notifications to the central controller in response to regular status polling, a manually initiated status update command, or via SNMP “traps” as allowed by NTCIP. When one of these events occurs, the sign controller shall create a data packet for transmission to the central controller that shall contain details about the event. The transmission of traps shall be governed by the NTCIP standards. The controller shall be configurable to enable or disable the transmission of traps for each event or error type. This configuration shall include the automatic initiation of these traps, including establishing modem connections if appropriate, when the NTCIP network permits transmission initiation by the sign controller.
* The following sections list errors and events that the controller shall report as defined above.

1. Over Temperature Shutdown

The VMS controller shall continuously monitor the VMS housing’s temperature sensors and shall automatically shut down the VMS if the internal cabinet temperature exceeds a safety threshold. This threshold shall have a default value of +140ºF (60ºC) and shall be configurable at the controller.

If the temperature approaches the threshold, the controller shall reduce the brightness of the VMS sign face. If the temperature continues to increase and exceeds that threshold, the controller shall trigger a warning notification event and blank the face of the sign. The sign face shall remain blank until the temperature begins to drop. As the temperature drops, the controller shall gradually increase the brightness of the display face, eventually returning to normal brightness.

The sign controller shall employ an algorithm to control the above brightness reductions and increases utilizing hysteresis to ensure that the display face does not visibly flicker as the temperature changes.

The event notifications sent for over temperature situations shall include visual indication on the controller’s front panel LCD, as well as a trap notification sent to the central control system.

1. Controller Restart

When the VMS controller detects that it has been restarted due to a manual reset or error condition, it shall send a trap notification to the central controller. It shall also automatically activate the NTCIP reset message if it is configured to do so.

1. Power Loss

When the VMS controller detects that it has lost power, it shall automatically indicate that on the front panel LCD. It shall also send a trap notification to the central controller and activate the NTCIP power loss message if configured to do so.

1. Power System Failure

The VMS controller shall automatically monitor the major power systems in the sign and detect when one of them has failed. These failures shall be reported on the front panel LCD and transmitted to the central controller if configured to do so.

1. Door Open

When the sign controller detects that one of the sign cabinet or control cabinet doors has been opened, it shall transmit a trap to the central controller indicating which door has opened.

1. Communication Loss

The VMS controller shall monitor the frequency of communication packets from the central controller. If the controller detects that communication has not occurred between the sign controller and central controller for longer than a configurable timeout, then the sign controller shall automatically activate a communication loss message as defined by NTCIP. This communication loss message shall be configurable and may be disabled as allowed by NTCIP.

Auxiliary Control

The VMS shall include auxiliary control capability that will provide a secondary user interface for VMS control, configuration, and maintenance from the System Controller Cabinet and the sign housing. The auxiliary control interface shall meet the same electrical, mechanical, and environmental specifications as the VMS controller except that it shall communicate with the primary sign controller, not with the central controller.

1. Interface

The auxiliary controller shall be located in the VMS and shall offer identical functionality as is available at the primary controller in the SCC. The auxiliary controller shall include an LCD panel and keypad, a local/remote switch, a reset switch, status LEDs, and one NTCIP compatible serial communication port that meets the same specifications as the VMS controller.

1. VMS Control Interface

The auxiliary control user interface shall include an identical menu system to the VMS controller with all of its features and functionality.

1. Controller Signal Interface

The auxiliary controller shall interface to the VMS controller using either outdoor rated fiber optic cable, outdoor rated and surge protected twisted pair cable, or a secure wireless connection. It shall be capable of operating up to 1000 feet from the VMS controller.

1. Virtual Auxiliary Control

As an acceptable alternative to the physical auxiliary controller specified above, a Virtual Auxiliary Control (VAC) application may be furnished and shall be capable of locally communicating and controlling the VMS controller from a laptop computer or an Android OS smart phone. The VMS controller shall communicate with the application over encrypted Wi-Fi using AES-256 encryption. The VAC application shall include a graphical user interface with all of the configuration, operation, and diagnostic functions and features available from the VMS controller interface.

The VAC Wi-Fi access point shall be located in the SCC. It shall have an operating temperature range meeting or exceeding that of the sign controller and it shall have an internal antenna capable of communicating with a device located on or near the VMS structure. The Wi-Fi access point shall be fully compatible with the Authority’s Cisco network management software.

Local Manual Control

It shall be possible to locally operate the VMS through the keypad and display of the primary VMS controller or auxiliary VMS control interface. It shall be possible to select and display preconfigured messages on the VMS or enter simple text messages through the local controller user interface. This level of control is mainly intended for diagnostic purposes.

918.53 Variable Speed Limit Signs (VSLS)

Delete the table and replace it with the following:

|  |  |
| --- | --- |
| Configuration: | Full matrix, full color LED, capable of displaying two-digit speed limits. Typical operation will be white numerals on black background. |
| Enclosure: | Sign enclosure is rear accessible for maintenance. |
| Height (max): | 6ft – 0 in |
| Width (max): | 5ft – 0 in |
| Depth (max): | 1ft – 0 in |
| Weight (max): | 250 lbs |
| Display Modules: | Exposed face modular LED boards (no mask) removable from the rear of the sign. |
| Pixels: | RGB pixels, 20mm pitch (distance between pixels). 30 Deg nominal viewing cone with a half power angle of 15 Deg. |
| Communications: | NTCIP 1203 (latest NJTA accepted version) |
| Power Source: | 120/240VAC, Single Phase. |
| Max. Power: | 300 Watts |

918.54 Hybrid Changeable Message Sign (HCMS)

Delete the Subsection and replace it with the following:

HCMS signs are the combination of rotating drum panels and embedded Variable Message Sign modules. Following are general characteristics of the HCMS.

|  |  |
| --- | --- |
| Enclosure: | Sign enclosure is non-walk-in with rear accessibility for maintenance. |
| Front Panel Height (max): | Type 1 (Ramp HCMS): 8 ft – 3 in  Type 2 (Mainline with Split Drum HCMS): 13 ft – 6 in  Type 3 (Mainline HCMS): 11 ft – 0 in |
| Panel Width(max): | Type 1 (Ramps): 19 ft – 6 in  Type 2 (Mainline with Split Drum HCMS): 24 ft – 0 in  Type 3 (Mainline HCMS): 33 ft – 0 in |
| Panel Depth(max): | 2 ft – 6 in |
| Weight (max): | Mainline HCMS: 9,000 lbs  Ramp HCMS: 4,000 lbs |
| VMS Display Modules: | Exposed face modular LED boards (no mask) removable from the front or rear of the sign. |
| VMS Pixels: | RGB pixels, 20mm pitch (distance between pixels). 60 Deg nominal viewing cone with a half power angle of 30 Deg. |
| Communications: | NTCIP 1203 (latest NJTA accepted version) |
| Power Source: | 120/240VAC, Single Phase |
| Max. Power: | 6400 Watts |

1. HCMS General Requirements

This Paragraph describes the minimum construction and operational functionality requirements for the rear access HCMS. The HCMS shall be furnished with all the materials, software licenses, and services necessary for the HCMS and associated equipment that fully comply with the functional requirements specified herein, including incidental items that may have been inadvertently omitted.

The complete HCMS housing, including rotary drums, VMS display modules, and system control cabinet, shall be designed and manufactured in-house by the HCMS Manufacturer. The HCMS shall be designed and constructed to utilize the latest available techniques with a minimum number of different parts, subassemblies, circuits, and modules to maximize standardization and commonalty. The sign shall be designed and constructed so as to present a clean neat appearance. Poor workmanship shall be cause for rejection of the sign. The performance of the sign shall not be impaired due to continuous vibration caused by wind, temperature, vibration or other factors. This includes the visibility and legibility of the display.

1. General Materials and Construction

All materials furnished, assembled, fabricated or installed under this item shall be new, corrosion resistant and in strict accordance with the details shown in the plans and as detailed in this specification. All details and functionality listed in this specification will be thoroughly inspected and tested by the Authority or its designated representative during the Factory Acceptance Testing. Failure to meet all details and functionality detailed in this specification shall be grounds for rejection of the equipment. All materials and components are to be submitted for technical review as part of the shop drawing review process. No material or item shall be ordered, procured, fabricated or installed until final approval is granted by means of stamped “Approved” shop drawing from the Authority or its designated design engineer.

Maximum overall HCMS sign housing and overall sign weights shall be as per this Specification section. The maximum criteria shall not be exceeded in order to conform to the design of the HCMS sign structure.

1. VMS Section

The VMS housing shall provide rear access for all LED display modules, electronics, environmental control equipment, air filters, wiring, and other internal HCMS components.

The VMS size shall be as specified in the Contract Documents. The VMS shall contain a full display matrix measuring as follows for each HCMS Type:

• Type 1: 64 pixel rows x 288 pixel columns

• Type 2: 64 pixel rows x 352 pixel columns

• Type 3: 64 pixel rows x 480 pixel columns

The matrix shall have a 20mm pixel pitch display capable of displaying full color messages that are continuous, uniform, and unbroken in appearance to motorists and travelers.

Each display pixel shall be composed of red, green, and blue LED’s. The pixel matrix shall be capable of displaying alphanumeric character fonts from a minimum of twelve (12) font sets with which messages can be formatted and displayed. Each font shall support up to 255 characters.

The VMS portion of the HCMS shall be able to display messages composed of any combination of alphanumeric text, punctuation symbols, and graphic images across multiple frames.

1. Drum Section

Each drum sign housing shall be composed of a separate module that shall provide rear access for all drum control modules, electronics, environmental control equipment, air filters, wiring, and other internal HCMS components.

The drum size and graphics shall be as specified in the Contract Documents. Each drum section shall be housed in a cabinet with measurements capable of meeting the text size, line spacing, character spacing and border requirements as shown in the NJTA Standard Drawings.

Origin

The HCMS shall be final assembled in the USA. To ensure proper service, support and logistics, US-based HCMS service and support personnel are required. The bidder shall certify that it will comply with the requirements of Section 1048 of the Intermodal Surface Transportation Efficiency Act of 1991 and Regulations in 49 CFR 661. Furthermore, the VMS section and Drum section of the HCMS shall individually be final-assembled in the USA, with US-based service and support personnel, to ensure proper service, support, and logistics of these individual sections.

Legibility

VMS messages shall be legible within a distance range of 80 feet (24.38 m) to 1,100 feet (335.28 m) from the HCMS display face under the following conditions:

* When the VMS is mounted so its bottom side is positioned between five feet and twenty feet above a level roadway surface
* Whenever the VMS is displaying alphanumeric text that is 18-inches (460 mm) high
* 24 hours per day and in most normally encountered weather conditions such as snow, rain, sun.
* During dawn and dusk hours when sunlight is shining directly on the display face or when the sun is directly behind (silhouetting) the VMS
* When the motorist eye level is 3 feet to 12 feet above the roadway surface.

Dimensions

The approximate HCMS housing dimensions shall be specified for the type of VMS and drum sections specified in the Contract Documents. The housing dimensions shall not exceed values shown in the NJTA Standard Drawings.

The HCMS shall be capable of being mounted in walk-through sign structures as shown in the NJTA Standard Drawings.

1. Power Requirements

The HCMS shall operate from a 120/240 VAC, 60Hz, single-phase power source. Total required demand current for a single HCMS and Controller Cabinet shall not exceed 50 Amps.

1. Sign Construction

Each HCMS housing shall be constructed to have a neat, professional appearance. All internal and external components shall be manufactured from corrosion resistant materials.

The HCMS housing bottom side shall contain small weep holes for draining any water that may accumulate due to condensation. Weep holes and ventilation/exhaust hoods shall be screened to prevent the entrance of insects and small animals.

The HCMS and sign controller components shall be capable of storage and operation without any decrease in performance over the environmental and temperature range specified in NEMA Standards Publication TS 4.

External HCMS component hardware (nuts, bolts, standoffs, rivets, fasteners, etc.) shall be fabricated from hot dipped or mechanically galvanized steel, stainless steel, aluminum, nylon, or other durable corrosion-resistant materials suitable for the roadway signage application.

All external bolts, nuts, and lock washers shall be stainless steel. No self-tapping external screws shall be used. All parts shall be made of corrosion resistant materials, such as plastic, stainless steel or aluminum. All materials used in construction shall be resistant to fungus growth and moisture deterioration. Dissimilar metals shall be separated by an inert dielectric material.

VMS and sign controller components shall be 100% solid-state, except for the environmental control fans and thermostats. All high voltage electrical components (exceeding 24 VDC) used in the VMS and the sign controller shall be UL (Underwriter’s Laboratory) listed and meet all applicable NEC code requirements.

All electronic components, except printed circuit boards, shall be commercially available, easily accessible, replaceable and individually removable using conventional electronics repair methods.

All workmanship shall comply with ANSI/IPC-A-610B Class 2 titled "Acceptability of Electronic Assemblies", ANSI/IPC-7711 titled "Rework of Electronic Assemblies" and ANSI/IPC-7721 titled "Rework and Modification of Printed Boards and Electronic Assemblies."

The presence of ambient radio signals and magnetic or electromagnetic interference, including those from power lines, transformers, and motors, shall not impair the performance of the HCMS as specified in NEMA Standards Publication TS 4. The HCMS shall not radiate electromagnetic signals that adversely affect any other electronic device, including those located in vehicles passing underneath or otherwise near the HCMS and its sign controller.

Fiber optic cable communications shall be used to the extent practical between the sign and the ground mounted control cabinet in order to isolate the equipment from voltage transients and reduce the need for copper cabling.

1. HCMS Face

The materials used on the sign face, other than the VMS display, shall be highly reflective to aid in nighttime visibility. All materials and paints shall be colorfast and designed to retain their true colors and reflectivity for a minimum of seven years under direct sunlight. The entire sign face shall be finished with high intensity micro-prism retroreflective sheeting, ASTM D4956-04 Type XI or better, such as 3M™ Diamond Grade™ VIP. A topcoat shall be utilized to provide improved scuff, scratch and gouge resistance and increased durability.

1. HCMS Housing

The HCMS shall be constructed as two separate enclosed sections, one for the LED VMS section of the sign and the other for the rotary drum section of the sign. Each section of the sign may have different depths as it is understood the drum section inherently requires more depth than a variable message sign due to the drum rotors. The two sections of the HCMS may be combined either before shipment or at the site prior to erection. Separate sealed sign housings shall allow for future partial sign replacements by section to facilitate partial upgrades of any one section of the sign.

No company logos, model numbers or text of any kind will be permitted on the outside of the sign housing.

The rear access housing dimensions and total weight of each section shall be as shown in this Specification or in the Plans. All electronic and electrical equipment compartments shall be designed and manufactured to be rain and weather tight.

1. VMS Housing

All sides of the HCMS housing exterior, except the front of the LED modules and the drum openings, shall be covered with 5052-H32 aluminum alloy sheets with a minimum thickness of 0.090” (2.286 mm). This external aluminum skin may be attached to the structural framework using a proven chemically bonding structural adhesive. The HCMS housing structural frame shall be constructed of 5052-H32 aluminum alloy members. The structural framework members may be permanently attached to each other using a proven chemically bonding structural adhesive.

The equipment within the sign housing shall be protected from moisture, dust, dirt and corrosion. The rear access housing shall meet NEMA 3R enclosure criteria as defined in NEMA Standards Publication 250-1997, “Enclosures for Electrical Equipment (1000 Volts Maximum).” Alternatively, a housing meeting NEMA 3 enclosure criteria shall be acceptable where all internal components conform to a minimum IP65 rating, or a more stringent rating where required elsewhere in these Specifications.

The sign housing shall be engineered and Professional Engineer certified to 2001 AASHTO and NCHRP Report 411 specifications for AASHTO basic wind speeds. The sign housing shall also be engineered and Professional Engineer certified to withstand loading combinations as outlined in 2001 AASHTO including: sign weight, ice and wind loads, and shall also meet strength requirements for truck-induced gusts as specified in NCHRP Report 412. The sign housing shall be engineered and Professional Engineer certified to withstand snow loading (40 PSF) for applicable geographical regions.

The HCMS housing’s right, left, front and rear exterior walls shall be vertical. The top and bottom walls shall be horizontal. LED display modules shall be mounted parallel to the front wall so the legible LED viewing area is optimized.

HCMS structural assembly hardware (nuts, bolts, washers, and direct tension indicators) shall be stainless steel or galvanized A325 high-strength steel and shall be appropriately sized for the application.

Exterior mounting assemblies shall be stainless steel or galvanized ASTM A 709, Grade 50 structural angles.

The HCMS housing for each type of HCMS shall be designed and fabricated to fit within the appropriate HCMS structure as depicted in the NJTA Standard Drawings

1. CMS Housing

The CMS portion housing shall be constructed as one integral box housing. Where possible, all external seams and joints shall be continuous MIG welded.

The sign housing shall be engineered and P.E. certified to 2001 AASHTO and NCHRP Report 411 specifications for AASHTO basic wind speeds. The sign housing, including the rotors, shall also be engineered and P.E. certified to withstand group loading combinations as outlined in 2001 AASHTO including: sign weight, ice and wind loads, and shall also meet strength requirements for truck-induced gusts as specified in NCHRP Report 412. The sign housing shall be engineered to withstand snow loading (40 PSF) for applicable geographical regions.

The portion of the CMS sign housing containing controller and power components shall meet NEMA 3R enclosure criteria as defined in NEMA Standards Publication 250-1997, “Enclosures for Electrical Equipment (1000 Volts Maximum).”

All fasteners and miscellaneous hardware shall be stainless steel.

If cable attachments are used in the sign housing, the cables shall be securely clamped as approved by the Engineer. No adhesive cable attachments will be allowed.

The housing, except for the face, shall be natural aluminum finish. The entire sign face shall be finished with high intensity micro-prism retroreflective sheeting conforming to Section 1.6, above.

The sign housing shall incorporate rain-tight enclosures at both ends to house control and rotor drive components and shall be accessible from the rear of the sign housing. The enclosure containing electrical and/or electromechanical components shall be equipped with a ventilation fan controlled by a thermostat to inhibit condensation within the enclosure. The fan and intake port shall be located at the bottom of the enclosure. The enclosure shall be vented at the top into the rotor area through screened exhaust ports. Hinged panels with neoprene gaskets shall be provided at both ends of the sign housing to allow rear access to control and drive mechanisms and to facilitate rotor removal if necessary.

The sign face shall incorporate self-regulating heat tape with a stainless steel braided jacket around the entire perimeter of each rotor aperture. The heat tape shall be encased in a metal tube that shall be formed to the perimeter of the aperture and shall be designed to prevent "icing" of the rotors. An adjustable thermostat shall regulate power to the heat tape. The heated portion of the sign face shall be isolated as much as possible from the rest of the sign face and housing.

The sign housing shall enclose all sides of the rotary drum except for the face to protect the control and rotor drive components from roadway containments, snow buildup, debris, and moisture. The equipment housed within the sign housing shall be protected from moisture, dust, dirt and corrosion. All seams and overlaps shall be designed to prevent the entrance of moisture. The sign housing shall be partitioned in a manner to divert any water entering the housing away from the top of the rotors and the mechanical and electrical equipment.

Provision for drainage by means of adequate screened weep holes in the bottom of the sign housing shall be provided. An extended rain lip shall be incorporated at the top of each rotor aperture to protect from rain entering the sign interior.

The presence of power transients or electromagnetic fields, including those created by any components of the system, shall have no deleterious effect on the performance of the system. The system shall not conduct or radiate signals which will adversely affect other electrical or electronic equipment including, but not limited to, other control systems, data processing equipment, audio, radio and industrial equipment.

1. Chemical Bonding

The external aluminum sheets may be attached to the cabinet frame members using a two-part chemically bonding structural adhesive. The adhesive shall be applied in a continuous bead on all cabinet frame surfaces that contact the aluminum sheet. The adhesive shall ensure a watertight seal is obtained around the entire perimeter of the cabinet and where any aluminum sheets are spliced.

To ensure that appropriate procedures are followed to bond the aluminum sheet and cabinet frame members, the structural adhesive manufacturer shall certify the HCMS manufacturer’s adhesive application process. The HCMS Manufacturer is responsible for performing all necessary testing of the adhesive to meet all requirements of the contract specifications.

1. Welding

If welding is selected by the manufacturer over chemical bonding, the minimum sheet thickness of the exterior panels shall be 0.1 inches.

The aluminum skin shall be welded to the HCMS cabinet frame. All exterior sheet seams shall be continuously seam welded to the HCMS frame to form a single structure. Stitch welding shall be used on the interior of the cabinet to attach the aluminum skin sheets to the aluminum extrusion frame.

All welding shall be by an inert gas process in accordance with the American Welding Society (AWS) Standards, 2008 ANSI/AWS D1.2/D1.2M Structural Welding Code for Aluminum. The HCMS manufacturer’s welders and welding procedures shall be certified by an ANSI/AWS Certified Welding Inspector to the 2003 ANSI/AWS D1.2/D1.2M Structural Welding Code for Aluminum.

Seams that separate adjacent LED display modules shall be sealed. LED display modules shall not be welded to the VMS portion housing.

The HCMS manufacturer shall submit documentary evidence and complete reference data for the above requirements. Reference data shall include the name and address of the welding organization, and the name and telephone number of an individual from the organization who can be contacted to verify the above requirements and all the details required to support the above requirements.

The Authority reserves the right to contact additional references. Any poor or unsatisfactory reference, as determined by the Authority in its sole and absolute discretion, will cause the manufacturer to be rejected.

1. Mounting Brackets and Miscellaneous Materials

Multiple mounting brackets in the form of steel angles, as shown on the NJTA Standard Drawings, shall be bolted to the HCMS housing exterior to facilitate attachment of the HCMS to the support structure. Mounting brackets shall be:

* Stainless steel or galvanized ASTM A 709, Grade 50 structural steel
* Attached to the HCMS structural frame members, not just the exterior sheet metal
* Installed at the HCMS Manufacturer’s factory
* Attached to the HCMS using mechanically galvanized A325 high-strength stainless steel bolts, washers, and lock washers
* Attached to the HCMS using direct tension indicators to verify that mounting hardware is tightened with the proper amount of force
* Installed such that all bracket-to-HCMS attachment points are sealed and water-tight
* Designed and fabricated such that the installing contractor can drill into them, if required, without penetrating the HCMS housing or compromising the housing’s ability to shed water

The HCMS Manufacturer shall supply neoprene pads, of the dimensions shown on the Plans, used to support the bottom of the sign. The pads shall be either virgin neoprene (polychloroprene) or virgin natural rubber (polyisoprene). The elastomer compound shall be temperature grade 3 and 60 durometers.

The HCMS Manufacturer shall design the bolted connection used on the steel angle mounting brackets to support the HCMS sign and connect to the plates on the HCMS support structure. The HCMS Manufacturer shall drill the holes in the mounting brackets per its design. The HCMS Manufacturer shall supply the required galvanized A325 high strength bolts, nuts and washers needed to make these connections.

1. Lifting Hardware

For moving and installation purposes, multiple galvanized steel lifting eyebolts, or some other lifting configuration shall be attached to the HCMS housing. Lifting hardware shall attach directly to the HCMS housing structural frame and be installed at the HCMS factory. All mounting points for eyebolts shall be sealed to prevent water from entering the HCMS housing. Lifting hardware, as well as the housing frame, shall be designed such that the HCMS can be shipped and handled without damage or excessive stress being applied to the housing prior to or during HCMS installation on its support structure.

The lifting eyebolts shall be easily removed by one individual without opening or entering the display and without any risk of compromising water-tightness. Special tools shall not be required. Removal of the eyebolts shall not create holes and no replacement bolts or other hardware shall be necessary to seal the cabinet. In addition, it shall not be required to remove the eyebolts or alternate lifting hardware, should this material fit within and be useful for future removal of the HCMS from the support structure.

The hardware used to attach the mounting brackets (nuts, bolts, washers, and direct tension indicators) to the HCMS cabinet shall be stainless steel and shall be appropriately sized for the application.

1. Exterior Finish

A reflective green sign panel shall border the entire message portion of the rotary drum section and VMS section of the HCMS front face with reflective sheeting as defined in Subsection 918.54(A)(7). All other HCMS housing surfaces, including the access doors, shall be natural mill-finish aluminum.

No sign manufacturer text or graphics other than what is specifically shown on the Plans shall be applied to the front face on any part of the HCMS.

1. Service Access

The HCMS housing shall provide rear access for all maintenance operations. The HCMS housing shall provide safe and convenient access to all modular assemblies, components, wiring, and subsystems located within the HCMS housing. All of those internal components shall be removable and replaceable by a single technician.

Access doors shall be provided for each section of the housing. One door shall also be provided for accessing the load center and sign control electronics.

The doors shall be restrained to prevent them from falling off or blowing around in the wind when in the open position. The doors shall not interfere with the mounting when in the open or closed position. Cleaning of the drum faces shall be possible from the rear of the sign without causing damage to the sign components.

When in the open position, the doors shall not obstruct any portion of the opening. Ventilation hoods and closed doors shall not obstruct the opening of any door. The doors shall not interfere with the flow of air through the ventilation hoods.

Each door shall contain screw-type quarter-turn latches. A tamper resistant key shall be used for activating the latches. All latches shall be keyed alike, with the same key used for the VMS and drum sections of the sign. Two keys shall be provided with each sign delivered. The latches shall pull the door tight and compress a gasket located around the perimeter of each door. The gasket shall prevent water from entering the cabinet.

1. Environmental Behavior

The HCMS shall be capable of operating without any decrease in performance over a temperature range as required under NEMA Standards Publication TS 4 (with a relative humidity of up to 100% condensing) unless otherwise noted in this specification.

1. Wiring and Power Distribution
2. Power and Signal Entrances

The sign and its sign controller shall be capable of operating from 120/240 VAC, with a maximum of 50 Ampere service, 60 Hertz, single-phase power. Two threaded conduit hubs shall be located on the rear wall of the HCMS housing. One hub shall be for incoming AC power and the other shall be for incoming signal cabling or a communications line.

1. Panel Board

The HCMS shall contain a power panel board or DIN rail mounted circuit breakers that meet the following minimum requirements:

• Service entrance-rated

• Short circuit ratings of 22,000 Amps and 10,000 Amps for the main and branch circuits, respectively

• UL listed panel boards and circuit breakers

1. Internal Wiring

All wiring and electrical equipment shall be in accordance with the requirements of the National Electrical Code. Wiring shall be neatly arranged, bundled, and mechanically supported. Wiring shall not impede the removal of display modules, power supplies, environmental control equipment, and other sign components and shall not impede the ability to clean drum faces or change drum message panels. Wires shall not make contact with or bend around sharp metal edges. The use of adhesive-backed, surface-mount wiring clamps shall not be permitted.

All internal wire terminations shall be made at appropriately rated terminal blocks or connectors. Crimp type terminals shall be affixed with a cycle-controlled crimp tool that will not permit a crimp to be made without the proper degree of compression. All terminal blocks shall be clearly labeled with terminal numbers. All wires shall be individually labeled at terminal points with a machine printed flexible tape or another professional means designed specifically for wire labeling.

1. Earth Grounding

The HCMS manufacturer shall provide one earth ground lug that is electrically bonded to each section of the HCMS housing. The lug shall be installed near the power entrance location on the HCMS housing’s rear wall. The HCMS installation contractor shall provide the balance of materials and services needed to properly earth ground the HCMS. All earth grounding shall conform to the National Electrical Code.

1. Transient Protection

The HCMS and sign controller signal and power inputs shall be protected from electrical spikes and transients as follows:

1. Sign AC Power

The AC power feed for all equipment in the sign cabinet shall be protected at the panel board by a parallel-connection surge suppresser rated for a minimum surge of 40 KA. This device shall conform to the following requirements:

• Withstand a peak 80,000-Ampere surge current, 40kA L-N, 40kA L-G

• Designed, manufactured, & tested consistent with: IEEE C6.41.1-2002, C62.41.2-2002, C2.45-2002, ANSI/IEEE C62.41-1991, C62.45-1992, NEMA LS-1, and NEC 285.6

• Less than 0.5 nanosecond response time

• Temperature range as specified in NEMA Standards Publication TS 4

• 5000 Category (C3 High) impulses with <10% drift, short circuit current rating of 200,000 rms symmetrical Amperes (UL Listed)

• UL listed to: UL 1449 200kA SCCR, UL 1283 4th Edition, and Canadian safety standards

1. Communication Lines

All copper cable communication lines shall be protected by transient suppression devices as appropriate for the type and operating voltage of the communication line. Communication line transient suppression devices shall be equipped with modular connectors for ease of replacement and shall electrically bonded to ground with a heavy gauge ground wire kept as short and straight as practical.

1. Variable Message Sign (VMS) Section
2. General Requirements

The Variable Message Sign (VMS) Assembly shall be a full matrix, full color LED display designed to work in conjunction with the rotary drum portion of the Hybrid Changeable Message Sign and shall conform to the requirements of these Specifications and as shown on the Plans. The VMS assembly may be constructed as an independent module, with a separate enclosure containing all required electronic assemblies, wiring, and environmental systems; but when combined with the rotary drum section and surrounding border, it shall operate and appear as one cohesive changeable message sign.

LED Display Modules

The VMS front face shall be constructed of multiple LED display modules, each of which shall support and protect an array of LED pixels. The LED display modules shall be placed adjacently in a two-dimensional matrix to form the face of the VMS. Each display module shall be constructed as follows:

* Each LED display module shall have a cam latch(es) that fasten it to the VMS housing. Latching mechanisms shall be actuated by a quarter-turn latching points on the front face of each LED display module. It shall be possible to activate the latches from both the front and back of each module. The module latches shall be actuated by a standard hex key wrench.
* The LED display modules shall be sealed to a minimum of IP67 standards.
* LED display modules shall not be welded to the VMS housing.
* Front face LED display modules shall provide a high-contrast background for the VMS display matrix. The front of each LED display module shall be black and contain high-contrast plastic masking for the LED pixels.
* Removal of the LED modules shall be from the interior of the HCMS cabinet. All LED display modules and internal components shall be removable and replaceable from the rear by a single technician through the rear of the HCMS. The LED module shall be unlatched, removed and pulled back through the opening in which it covered. All modules shall be secured to the sign housing with a quick release lanyard or tether to prevent the modules from becoming dislodged from the VMS while transitioning through the opening during the removal and replacement process.
* In the presence of wind, rain and snow, the VMS front face shall not distort in a manner that adversely affects LED message legibility.
* Each LED display module shall contain no more than one circuit board to minimize electrical connections. All LED modules shall be manufactured using laminated fiberglass printed circuit boards with conformal coating to minimize environmental corrosion.
* The LED pixels in the module shall be protected by a black contrast-enhancing silicone elastomer that surrounds the base of the LEDs and seals the entire front face of the module to prevent water penetration and corrosion, while not obstructing the viewing angles of the LEDs.
* LED display module electrical connections shall use a quick-disconnect locking connector. Removal of an LED display module from the VMS shall not require a soldering operation.
* It shall not be possible to mount a display module upside-down or in an otherwise incorrect position within the VMS display matrix.
* All LED display modules shall be identical and interchangeable throughout the VMS.
* Removal or failure of any LED module shall not affect the operation of any other LED module or sign component. Removal of one or more LED modules shall not affect the structural integrity of any part of the sign.
* Each LED display module shall contain a minimum of 256 LED pixels configured in a two-dimensional array. The pixel array shall be a minimum of 16 pixels high by 16 pixels wide.
* The distance from the center of a pixel to the center of each adjacent pixels, both horizontally and vertically, shall be 0.78 inches (20mm).
* All pixels shall contain an equal quantity of LED strings.
* The failure of an LED string or pixel shall not cause the failure of any other LED string or pixel in the VMS.
* Each pixel shall contain the quantity of discrete LEDs needed to output white colored light at a minimum luminous intensity of 12,400 candelas per square meter when operated within the forward current limits defined in these specifications.
* The circular base of the discrete LEDs shall be soldered so that they are parallel to the surface of the printed circuit board. The longitudinal axis of the LEDs shall be perpendicular to the circuit board.

Discrete LEDs

VMS pixels shall be constructed with discrete LEDs manufactured by Avago Technologies (formerly Agilent Technologies), Toshiba Corporation, Nichia Corporation, OSRAM, or approved equivalent. Discrete LED’s shall conform to the following specifications:

* All LEDs shall have a minimum unimpeded viewing cone of 60 degrees with a half-power angle of 30 degrees measured from the longitudinal axis of the LED.
* Red, green and blue LEDs shall be able to produce colors that will meet NEMA Standards Publication TS 4 Section 5.5.1 requirements for chromaticity.
* The LED manufacturer shall perform color sorting of the bins. Each color of LEDs shall be obtained from no more than two (2) consecutive color “bins” as defined by the LED manufacturer.
* The LED manufacturer shall perform intensity sorting of the bins. Each color of LEDs shall be obtained from no more than two (2) consecutive luminous intensity “bins” as defined by the LED manufacturer.
* The various LED color and intensity bins shall be distributed evenly throughout the sign and shall be consistent from pixel to pixel. Random distribution of the LED bins shall not be accepted.
* The LED package styles shall be through-hole with standoffs.
* All LEDs used in all VMS provided for this contract shall be from the same manufacturer and of the same part number, except for the variations in the part number due to the intensity and color bins.
* The LEDs shall be rated by the LED manufacturer to have a minimum lifetime of 100,000 hours of continuous operation while maintaining a minimum of 70% of the original brightness.

Pixel Drive Circuitry

Each LED display module shall contain electronic driver circuitry that shall individually control all pixels on that module. The driver circuitry shall conform to the following specifications:

* LED driver boards shall be manufactured using a printed circuit board.
* Each LED driver board shall be microprocessor-controlled and shall communicate with the sign controller on a wire or fiber optic communication network using an addressable network protocol. The microprocessor shall process commands from the sign controller to display data, perform diagnostic tests, and report pixel and diagnostic status.
* Constant current LED driver ICs or another method that provides at least the same level of control (such as PWM) shall be used to prevent LED forward current from exceeding the LED manufacturer’s recommended forward current whenever a forward voltage is applied. To maximize LED service life, LED drive currents will not be allowed that exceed the manufacturer’s recommendations for the 100,000-hour lifetime requirement.
* The LED pixels shall be directly driven using pulse width modulation (PWM) of the drive current to control the display intensity. This LED driver circuitry shall vary the current pulse width to achieve the proper display intensity levels for all ambient light conditions. The drive current pulse shall be modulated at a frequency high enough to provide flicker-free operation and a minimum of 200 brightness levels.
* The LED driver circuitry shall receive updated display data at a minimum rate of two (2) frames per second from the sign controller.
* Each LED driver circuit shall be powered by 24 VDC from external regulated DC power supplies. This input voltage shall be fused. Each driver board shall receive power from a minimum of two (2) independent power supplies. Indicator LEDs shall be provided to indicate the status of various voltage levels on the board.
* The voltage of each power input shall be measured to the nearest tenth of a volt and reported to the sign controller upon request. Each driver circuit shall also contain one status LED for each power source that indicates if the power source is present or not.
* The LED driver circuitry shall be able to detect that individual LED strings or pixels are stuck on or off and shall report the pixel status to the sign controller upon request.
* The LED driver circuit shall contain a LED display that indicates the functional status of the driver and pixel boards. At a minimum, it shall indicate error states of the LED pixels and communication network. The indicator shall be positioned such that a maintenance technician can easily view the status code for diagnostic purposes. The status codes shall also be reported to the sign controller upon request.
* Removal or failure of a single driver circuit board shall not affect the performance of any other LED display module in the VMS.
* Individual addressing of each driver circuit shall be configured via the communication wiring harness or module position. No on-board addressing jumpers or switches shall be allowed.

Regulated DC Power Supplies

The LED pixel display modules shall be powered with auto-ranging regulated switching power supplies that convert the incoming AC to DC at a nominal voltage of 12, 24, or 48 Volts DC. Power supplies shall be wired in a redundant parallel configuration that uses multiple supplies for the VMS display matrix.

Power supplies shall be designed to provide redundancy within the display to ensure continued operation under a failure of a single power supply. Power supplies shall be redundant and rated such that if one supply fails, the display shall be able to operate 100% of the pixels in that display region at 100% brightness when the internal VMS air temperature is +140ºF (60ºC) or less.

Each power supply within each redundancy pair shall receive 120VAC power from separate circuits on separate circuit breakers, such that a single tripped breaker will not disconnect power from both supplies. It shall be acceptable for a single circuit breaker to power multiple DC power supplies provided that none of those power supplies are in the same power supply pair.

The power supplies shall be sufficient to maintain the appropriate LED display intensity throughout the entire operating input voltage range.

The output of each power supply shall be connected to multiple circuits that provide power to the LED modules. Each output circuit shall not exceed 15 Amperes..

Each power supply shall be monitored by a microprocessor-controlled circuit. This circuit shall monitor the voltage of each power supply and the status of each output circuit’s fuse. The power supply voltages and fuse states shall be reported via a communication network to the sign controller and reported to Central by the sign controller.

The power supplies used to power the LED pixel modules shall be identical and interchangeable throughout the VMS.

Each power supply shall be protected by an independent surge protector.

Regulated DC power supplies shall conform to the following specifications:

* Nominal output voltage of 12, 24, or 48 VDC +/- 10% unless otherwise approved
* Operating input voltage range shall be a minimum of 90 to 260 VAC
* Operating temperature range shall be as specified in NEMA Standards Publication TS 4
* Maximum output power rating shall be maintained over a minimum temperature range as specified in NEMA Standards Publication TS 4.
* Power supply efficiency shall be a minimum of 80%
* Power factor rating shall be a minimum of 0.95
* Power supply input circuit shall be fused
* Automatic output shut down if the power supply overheats or one of the following output faults occurs: over-voltage, short circuit, or over-current
* Maximum allowable power supply weight shall be 15 pounds.
* Power supplies shall be UL listed
* Printed circuit boards shall be protected by a silicone conformal coating

Control Systems

The VMS shall be controlled by primary and auxiliary locations in compliance with Subection 918.54(D) of these specifications.

Environmental Monitoring Systems

The VMS shall include sensors that monitor and report ambient (external) light level and temperature, as well as the internal temperature.

1. Ambient Light Measurement

Sensors that measure the outdoor ambient light level at the HCMS site shall be mounted in-line with the HCMS housing walls. This ambient light measurement system shall consist of two (2) electronic light sensors. The light sensors shall be placed such that they measure the ambient light levels striking the front and rear of the HCMS. The HCMS sign controller shall continuously monitor the light sensors and adjust the LED display matrix intensity to a level that creates a legible message on the VMS face. The VMS shall allow for remote adjustment of the light sensor measurement to display intensity table from the central server software.

1. Ambient Temperature Measurement

A minimum of one (1) ambient temperature sensor shall be mounted to either the rear wall or bottom side of the HCMS housing. An ambient outdoor temperature sensor shall be placed such that it is never in direct contact with sunlight. The external temperature sensor reading shall be continuously monitored by the HCMS sign controller and shall be reported to the HCMS control software upon request.

1. Internal Temperature Measurement

The VMS shall contain a minimum of two (2) temperature sensors that are mounted near the top of the VMS interior. The temperature sensor(s) shall measure the temperature of air in the cabinet over a minimum range from -40°F to + 176°F (-40°C to 80°C). The temperatures from the sensors shall be continuously measured and monitored by the sign controller. A temperature reading greater than a user selectable critical temperature shall cause the sign to go to blank and the sign controller shall report this action to the central controller. This user selectable critical temperature shall be capable of being changed by the central controller or laptop computer. The central controller and laptop computers shall have the ability to read temperature measurements from the sign controller. The internal temperature sensor’s outputs shall be continuously monitored by the HCMS sign controller and shall be reported to the VMS control software upon request.

Interior VMS Environmental Control

The VMS shall contain systems for cabinet ventilation and safe over-temperature shutdown.

1. Housing Ventilation System

The VMS housing shall contain a thermostatically controlled ventilation system designed to keep the internal VMS air temperature lower than +140°F (+60°C), when the outdoor ambient temperature is +115°F (+46°C) or less.

Cooling fans shall be the ball-bearing type and shall be mounted in a line across the rear of the VMS housing wall. One fan at a minimum shall be installed per each exhaust port. Intake ports shall be located in a line across the rear VMS wall.

Each ventilation fan shall contain a sensor to monitor its rotational speed, measured in revolutions per minute. The fan speed shall be reported via a communication network to the sign controller upon request. Alternatively, the ventilation system status may be monitored by airflow sensors in-line with the ventilation air stream. The airflow sensors shall be sufficiently dampened to prevent oscillations and false indications.

An aluminum hood or louvers attached to the rear wall of the VMS shall cover each air intake and exhaust port. Openings shall be screened to prevent the entrance of insects and small animals. All intake and exhaust ports shall be designed to prevent blowing rain from entering the VMS.

1. Over Temperature Safety Shutdown

The HCMS controller shall automatically shut down the LED modules to prevent damaging the LED’s if the measured internal cabinet air temperature exceeds a maximum threshold temperature. The threshold temperature shall be configurable and shall have a default factory setting of 140°F (+60°C).

Sign Controller Signal Interface

Communication signals from the sign controller in a ground-mounted controller cabinet to the VMS shall use redundant fiber optic cables. Each VMS shall have two (2) duplex fiber optic communication ports for connection to the sign controller. A failure of either communications port or fiber optic cable shall not interrupt communications through the other communications port. It shall also be possible to connect multiple VMS to a single controller in a ring configuration using the redundant communication ports.

The VMS fiber optic cable shall comply with the following specifications:

* 62.5/125 or 50/125 μm diameter multi-mode fibers
* ST, SC, or LC style connectors to match style of controller connector
* Rated for indoor/outdoor use
* UL-rated
* PVC outer jacket
* Tight buffer inner jacket
* Operating temperature range: as specified for the sign and outdoor equipment.

The Contractor shall furnish and install fiber optic cable for connection to the ground-level control cabinet. A minimum of six (6) fibers shall be provided with one (1) for controller to sign commands, one (1) for sign to controller responses, and four (4) spares. All fiber strands, whether used or spare, shall be terminated at both ends by the installer. The fibers shall terminate in a mounted termination panel or connectorized block at both ends and shall be connected to the sign controller and sign interface by way of flexible and durable fiber optic patch cords.

1. Changeable Message Sign (CMS) Section
2. General Requirements

This Subparagraph describes the minimum construction and operational functionality requirements for the rotary drum portion of the rear access HCMS. The HCMS Manufacturer shall provide all the materials and services necessary for the HCMS and associated equipment that fully comply with the functional requirements specified herein, including incidental items that may have been inadvertently omitted.

The rotary drum CMS, the sign messages and sign types by location, sample letter size, and letter style shall be as shown in the Contract Drawings. Each drum shall be able to display three or four discrete messages, as shown in the report. Corrosion resistance shall be provided for all internal sign components. The CMS shall include a minimum number of moving parts, sub-assemblies and points of failure.

1. Sign Controller

The sign controller shall be as specified in Section 918.54(D) of these specifications.

1. Rotating Drums

The drums shall provide the capability of displaying three or four message selections per drum, as shown in the plans. Each drum frame shall be constructed as a rigid truss or tube and shall be designed to AASHTO standards with minimal deflection due to the rotors own weight, wind load forces, and the weight of the attached sign panels, and to allow for proper operation. The drums shall rotate on concentric shafts supported by self-aligning end bearing assemblies. The drum message face shall not constitute structural members of the drum assembly.

Drums shall be designed to drain any precipitated or condensed moisture that may accumulate internally. An external rain lip shall be included at the top of each drum aperture. Sign face openings shall have Teflon coated polyester fabric dust wipers to protect the sign interior from moisture, dust and contaminants.

Each drum shall accommodate either three or four removable, flat, distortion free sign panels, as shown in the plans. The end bearings shall be sealed and permanently lubricated to eliminate the need for periodic service.

It shall be possible to change the message copy on each drum face from the back of the sign by replacing the face panels. Replaceable message panels shall consist of single-piece aluminum sheets with shop applied reflective sheeting, graphics and text. The message panels shall be securely fastened to the drums with removable corrosion-resistant colored hardware to match the panel sheeting.

Each drum rotor shall have one motor and drive mechanism. Multiple rotors as part of the same sign shall all move together as a group, but operated and monitored individually by the sign controller. Split drum rotors, for Type 2 HCMS, shall be coupled via a stainless steel roller chain. Fabric belt coupling is not acceptable.

1. Drive Motors

The entire drive mechanism shall be installed in a weather-tight enclosure in the sign housing. All components of the mechanism shall be sealed and permanently lubricated to eliminate the need for periodic service requirements. The gear box shall be lubricated with synthetic lubricant to prevent congealing at extreme low temperatures.

All major components of the drum drive assembly shall be readily available, over-the-counter parts requiring no modification. The motor shall be low voltage (less than 120V), wash-down rated (extreme environment), with a stainless steel housing. The Proposer is responsible for selecting the specific motor voltage and power supply location to ensure operation of the sign in accordance with the stated requirements. Minimum rotation speed shall be 6 RPM.

Drum rotation shall be bi-directional. The direction of drum rotation, as determined by the sign controller, shall be based on the shortest rotational distance to the selected message face.

Each drum drive assembly shall incorporate a magnetic-disk brake to stop and maintain drum position. The brake assembly shall be engaged when de-energized to stop and maintain drum position in the event of power or control system failure. A local, mechanical release for the brakes shall be provided such that each motor assembly may be manually rotated by a hand crank.

Each sign shall be equipped with a removable hand crank for manual drum rotation. One hand crank shall be secured in each sign enclosure in an easily accessible location. It shall also be possible to operate the hand crank control from a standard cordless drill. If an adaptor is required for drill operation of the hand crank control, the adaptor shall be supplied and secured in each sign enclosure.

Each sign shall incorporate in the drive component enclosure a maintenance/test panel. Each maintenance panel shall have a Safety Test Switch located in close proximity to the drive motor. This switch shall include an ON/OFF/MOMENTARY-ON configuration. The purpose of this switch is to provide a safety disconnect while performing maintenance on the rotor drive system and to provide a functional test of drive system components exclusive of all automatic control components.

Each rotor shall be actuated by solid state load switches located in close proximity to its respective drive motor (One for the motor and one for the brake). Electro-mechanical relays shall not be used.

Each rotating drum compartment shall incorporate a door safety switch to prevent inadvertent rotor actuation during maintenance. If multiple switches are required, the switches shall be wired such that rotor activation shall be prevented if any one drum compartment door is opened. The sign controller shall initiate a “door open” error indication when any of the drum compartment doors are open. Opening the motor drive compartment or AC power compartment doors shall cause the controller to initiate a door open error indication, but not stop drum rotation.

1. Rotor Position Requirements

Each revolving rotor assembly shall be designed such that the rotor stops in parallel alignment with the face of the sign, with a tolerance of 1 degree over rotation or under rotation. The sign face positioning shall not be affected by wind loads, vibration, etc. It shall be possible to individually adjust and store the final stop point of each drum face by way of the sign controller software.

The position of each drum shall be monitored with a solid-state absolute position encoder. The encoder shall be an integral part of the drive system located within a weather tight enclosure in the sign housing. The encoder output shall be used to enable the controller to set the drum position and to report the exact drum position to the control software.

1. Drum Illumination

While illumination of the reflective sheeting is typically achieved by vehicle headlights at night, many of the HCMS will be positioned in areas where there are tight geometric curves in the roadway. Under these circumstances, headlights do not illuminate the signs with sufficient time for motorists to read and distinguish the message. As such, it is necessary provide illumination of the CMS portion of the HCMS. Each rotary drum shall be illuminated using LED “strip” lighting. This LED light strip may be incorporated into the rain-lip as a part of each drum line section, or as otherwise recommended by the HCMS Manufacturer. The Manufacturer shall demonstrate that this lighting, its distribution and uniformity is factory tested prior to final fabrication. The lighting shall not bleed onto the VMS portion of the HCMS sign display. Ideally, the lighting should be balanced with the VMS intensity to provide a uniform appearance at night.

Drum face lighting shall be controlled by the sign controller. The sign controller shall monitor ambient light conditions and based on configurable thresholds, activate a solid state relay to turn the lighting on or off. For installations where more than one HCMS is installed on one sign structure, the lighting control shall be interlocked so that all sign lighting turns on or off at the same time.

1. HCMS Controller

This Paragraph describes the minimum specifications for the HCMS controller to be provided with the contract. Each HCMS shall include a sign controller, and associated equipment. The HCMS Manufacturer shall provide all the materials, software, and services necessary to install HCMS controllers and associated equipment that fully comply with the functional requirements specified herein, including incidental items that may have been inadvertently omitted.

1. General Requirements

Ideally, the HCMS shall contain a single HCMS controller that controls both the LED VMS and the rotary drum CMS segments included in the HCMS. Additionally, an auxiliary control capability shall be included as specified in Subparagraph 918.54(D)(18). Both the VMS and CMS portions of the sign should be treated as one single display by the HCMS controller. This is to ensure that the sign is operated and monitored as a single Hybrid Changeable Message Sign and there are no conflicting messages between the VMS and CMS sections. If a single controller for the CMS and VMS sections of the HCMS cannot be provided, the HCMS manufacturer must provide software to link the independent controllers for unified operation and to prevent conflicting messages.

The sign controller shall meet the following operational requirements:

* Communicate using the NTCIP v2 protocol or later.
* Contain memory for storing changeable and permanent messages, schedules, and other necessary files for controller operation.
* Include a front panel user interface with an LCD display, or equivalent, and a keypad for direct operation and diagnostics as described herein.
* Contain a minimum of two (2) NTCIP–compliant RS232 communication ports with DB9 connectors.
* Contain a minimum of two (2) NTCIP-compliant Ethernet ports with RJ45 connectors
* Contain firmware (embedded software) that shall monitor all external and internal sensors and communication inputs and control the display modules as directed by external control software and the front panel interface. NTCIP shall be natively supported in the HCMS controller. External protocol converter or translator devices are not allowed.
* Contain sufficient inputs and outputs to provide control and feedback for the drum sign segments contained in the HCMS.
* All control capability required for each HCMS site shall fit within the space available within the System Control Cabinet (SCC) specified in Specification Section 918.19.
* HCMS installations may be composed of two separate Hybrid Signs mounted on a single structure. Both HCMS in this configuration shall be controlled by equipment contained in a single SCC.

1. Controller Location

The primary sign controller and associated communication equipment may be installed either inside the SCC or sign enclosure. Auxiliary control capability shall be installed as needed to provide keypad and display access to the controller from both the SCC and sign enclosure.

1. Environmental

The sign controller shall meet the environmental requirements defined in NEMA Standards Publication TS 4, Hardware Standards for Dynamic Message Signs (DMS), with NTCIP Requirements.

1. Sign Controller Functions

The sign controller shall be controlled from the Authority’s existing Central Controller or a laptop computer, which shall specify the appropriate display. The sign controller shall be capable of controlling at least one LED VMS sign section and two drum sign rotors, each rotor having three or four faces. This sign controller and its software shall perform the following functions:

* Display a message
* Report errors and failures, including:

(1) Data Transmission error

(2) Receipt of invalid data

(3) Communications failure recovery

(4) HCMS component failure (failure of any rotary drum to reach its required position, VMS pixel error, power supply failure, etc.)

(5) Power recovery

* Message and status monitoring:

The sign controller shall transmit a return message to the Central Controller whenever it receives a valid transmission requesting sign status. The return message shall contain the following:

(1) Address or ID of the sign

(2) Message that is actually displayed, to include position verification feedback of each rotor based on the output of the encoder position using NTCIP standards.

(3) Message source information (Central, Local, etc.)

(4) Device error codes

(5) Uninterruptible power supply status

* Severe error condition response:

The sign controller shall report severe error conditions to the central controller. The severe error conditions are:

(1) AC power failure.

(2) AC power recovery.

(3) Surge protection has been tripped

* Communication Failure

In the event the central controller fails to communicate within a programmable time limit with the sign controller, the sign shall respond per the requirements of NTCIP. This function shall apply only when the sign controller is in central control mode.

* Sign Failure

Failure of any sign section shall not affect the operation of any other sign section in the system.

* Power Failure

The sign controller shall maintain its internal time clock during power outages less than 255 minutes and display the proper message when power is restored.

* Remote Reset

The sign controller shall be capable of being remotely reset from the central controller.

1. Operational Requirements
2. Front Panel User Interface

The sign controller’s front panel shall include a keypad and LCD. These devices shall be used to perform the following functions with the sign controller and HCMS:

• Monitor the current status of the HCMS, including the status of all sensors, a what-you-see-is-what-you-get (WYSIWYG) representation of the message visible on the LED VMS display face, and an indication of the rotational position and displayed face text of each CMS drum

• Perform diagnostics testing and monitoring of various system components, including pixels, power systems, sensors, drum rotation, and more

• Activate LED VMS messages stored in memory and activate associated drum displays

• Configure display parameters, including display size and colors

• Configure communications port settings and NTCIP options

The front panel interface shall also include:

• Power switch to turn the controller on and off

• “Local/remote” switch that places the controller in local mode such that it can be controlled from the front panel interface, instead of via the primary NTCIP communication channel

• Reset switch to quickly restart the controller

1. Memory

The sign controller shall have non-volatile electronically changeable memory. This memory shall be formed by flash or battery-backed static RAM integrated circuits that retain the data in memory indefinitely following a power loss. This changeable memory shall be used to store messages and schedules. The controller memory shall be capable of storing a minimum of 100 changeable messages in non-volatile RAM.

1. Internal Clock

The HCMS sign controller shall contain a computer-readable clock that has a battery backup circuit. The controller shall allow for connection to a Network Time Protocol (NTP) sever for synchronization of the internal clock.

1. Communications

All remote communication ports shall be NTCIP-compatible as defined in the “Requirements for NTCIP Compatibility” section of these specifications.

1. Communication Mode

The HCMS sign controller shall be able to receive instructions from and provide information to a computer containing HCMS control software using the following communication modes:

• Remotely via direct, fiber, or wireless communications with a remotely located computer. The system communications backbone, as well as all field modems or signal converters, will provide the HCMS sign controller with an Ethernet signal.

• Locally via direct connection with a laptop computer that is connected directly to the sign controller using any of the following connections: RS232, USB, or Ethernet.

1. Serial Communication Port

The HCMS controller shall contain a minimum of one (1) serial communication port. This port shall support a direct communication interface for local laptop control using either a DB9 or USB connector.

The baud rate, connection type, and NTCIP communication protocol shall be configurable. The port must support all typical serial baud ranging from 1200 to 115,200 baud. The port shall be capable of supporting the NTCIP 2103 (PPP), NTCIP 2201 (Null), and NTCIP 2202 (Internet) transport profiles. Only one of each of the transport and sub network profiles shall be active at any time on the port.

1. Ethernet Port

The HCMS controller shall contain a minimum of one (1) 10/100Base-T Ethernet communication port for communicating from the central control system to the HCMS sign controller. The Ethernet port shall have a standard RJ45 connector.

Communications on the Ethernet port shall be NTCIP-compatible using the NTCIP 2202 Internet transport profile and the NTCIP 2104 Ethernet sub network profile. This shall permit the controller to be operated on any typical Ethernet network using the TCP/IP and UDP/IP protocols.

1. Controller Addressing

The HCMS controller shall use the NTCIP 2104 (Ethernet) network protocol with a static v4 IP address. Both the IP address and subnet shall be configurable. The controller addressing shall be configurable through the front panel user interface.

1. Transient Protection

The serial and Ethernet communication ports in the HCMS controller shall be protected with surge protection between each signal line and ground. This surge protection shall be integrated internally within the controller.

1. HCMS Control Outputs

HCMS sign controller(s) located in the ground level SCC shall transmit and receive data packets to and from the HCMS via dedicated fiber optic cables. The controller shall communicate with all sensors, drivers, and other devices utilizing a bus network running throughout the HCMS.

Data transferred shall include pixel control and monitoring, drum control and monitoring, sensor values, and I/O readings from various devices, such as door sensors and power supply monitors. Pixel data shall include the states to be displayed on the sign face as well as diagnostic data retrieved from the LED drivers.

An absolute encoder shall be utilized to monitor the position of each drum. Adequate surge protection shall be installed to mitigate the effects of spikes that result from motor operation and all other sources.

1. Messaging

The HCMS controller shall have the ability to display messages on the VMS display face and drum sign segments as required herein.

1. Message Presentation on the VMS Display Matrix

The sign controller shall control the LED drivers in a manner that causes the desired message to display on the VMS sign. At a minimum, the sign controller shall support the following features as described in the VMS specification:

• Display of alpha numeric characters, including letters, numbers, and punctuation

• Selection of particular character font’s style

• Horizontal alignment of text on the display, including left, center, and right justification

• Vertical alignment of text on the display, including top, middle, and bottom justification

• Adjusting the spacing horizontally between characters or vertically between lines of text

• Alternating between pages of a multiple-page message

• Display of graphic bitmaps of various sizes ranging from very small to the size of the entire VMS matrix

• Simultaneous display of character fonts over graphic images

1. Message Presentation on the CMS

The sign controller shall control the CMS rotary drums to display the preconfigured arrangement of drum faces for the selected message. The controller display shall present a menu of message choices showing a text representation of each message. It shall be possible to select and display a desired message from the controller keypad.

1. VMS Message Effects

The VMS shall be able to display messages using the following types of effects:

• Static Message – The selected message is displayed continuously on the face until the sign controller blanks the sign or causes the display of another message.

• Flashing Message – All or part of a message is displayed and blanked alternately at rates between 0.1 seconds and 9.9 seconds. The flash rate is user programmable in increments of 0.1 seconds.

• Scrolling Message – The message moves across the display face from one side to the other. The direction of travel is user selectable as either left-to-right or right-to-left.

• Multiple-Page Message – A message contains up to six different pages of information, with each page filling the entire pixel matrix. Each page’s display time is user programmable from 0.1 seconds to 25.5 seconds, and adjustable in increments of 0.1 seconds.

1. Message Change Sequence

HCMS message activation shall operate in the following sequence of events:

* Blank all LED VMS sections
* Verify that all VMS are blank
* Roll CMS drums to selected message display
* Verify that all CMS drums are in the correct position to display the selected message
* Post selected message on VMS
* Verify that all VMS are displaying the selected message

Failure of any sequential step shall cause the sequence to stop and the controller to report to the central server an error message along with the currently displayed message information. Local control of the specified message change sequence is preferred, but if this not possible, the sequence may be controlled by the central server. At locations where two HCMS are installed on the same structure as a functional pair, the message change sequence of the two signs shall occur simultaneously to prevent a temporary message mismatch.

1. Message Activation

Messages shall be activated on the HCMS in three ways:

* Manual – An operator using the front panel LCD/keypad interface, local control panel switches, or NTCIP-compatible control software manually instructs a particular message to be activated.
* Schedule – The internal time-based scheduler in the controller may be configured to activate messages at programmable times and dates. Prior to activation, these messages and their activation times and dates shall be configured using the control software. (Alternatively, schedules may be stored and managed in the Central controller).
* Events – Certain events, such as a communication or power loss, shall trigger an event response when they occur. These events shall be configured using the control software. Configurable event responses shall include the ability to blank the sign, post a pre-configured default message, or retain the existing message display.

A displayed message shall remain on the sign until one of the following occurs:

* The message’s duration timeout expires.
* The controller receives a command to change the message.
* The controller receives a command to blank the sign.
* The schedule stored in the controller’s memory (or stored and managed in the Central controller) indicates that it is time to activate a different message.
* A special event, such as a loss of communication, occurs that is linked to message activation.

It shall be possible to confer a “priority” status onto any message, and a command to display a higher priority message shall cause any lower priority message to be overridden.

1. Schedule Activation

The HCMS sign controller shall support the activation of messages based on a time/date-based schedule, stored either in the sign controller, or in the Central controller). The format and operation of the message scheduler shall be per the NTCIP 1201 and NTCIP 1203 standards.

1. Display of Alphanumeric Text

* The HCMS sign controller shall support the storage and use of a minimum of twenty (20) font sets with which messages can be formatted and displayed. Each font shall support up to 255 characters. All text font files shall include the following characters:
* The letters “A” through “Z”, in both upper and lower case
* Decimal digits “0” through “9”
* A blank space
* Eight (8) directional arrows
* Punctuation marks, such as: . , ! ? – ‘ ’ “ ” : ;
* Special characters, such as: # & \* + / ( ) [ ] < > @
* The HCMS Manufacturer shall provide the HCMS controller with the following fonts preinstalled. The controller shall support changing or replacing these fonts from the central software using NTCIP. All font characters are variable width except where indicated otherwise.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Pixel Array | Character Height (approx.) | Character Width (avg.) | Stroke Width (pixels) | Comments |
| 20x12 | 16” | 9.5” | 3 | Small |
| 20x16 | 16” | 12.5” | 4 | Small – MUTCD \* |
| 23x15 | 18” | 12” | 3 | Standard |
| 23x15 | 18” | 12” | 3 | Standard, fixed width |
| 23x17 | 18” | 13.5 | 3 | Standard, wide |
| 23x19 | 18” | 14” | 4 | Standard – MUTCD \* |
| 24x15 | 19” | 12” | 3 | Tall |
| 24x15 | 19” | 12” | 3 | Tall, fixed width |
| 24x19 | 19” | 15” | 4 | Tall – MUTCD \* |

* \* Note: Fonts commented as “MUTCD” in the table above shall be made to simulate the appearance and size requirements of the Manual on Uniform Traffic Control Devices (MUTCD) and the “Standard Highway Signs and Markings” (SHSM) Book for Series E-Modified text characters.

1. Display of Graphic Images

* The VMS control software shall support the inclusion of graphics in messages in accordance with NTCIP 1203 v2. The VMS may support graphics that exceed current NTCIP limitations by using manufacturer specific MIB objects and MULTI tags.

1. VMS Intensity Control

* The HCMS controller shall provide a means to change the brightness of the display matrix manually or automatically. The manual control will allow the user to select one of at least 100 intensity levels, which will be communicated to the LED drivers in the VMS. The brightness shall remain at that level until the user changes the level or sets the controller to automatic mode.
* The automatic intensity control mode shall monitor the ambient light sensors of the VMS and use a mathematical algorithm to automatically select one of 100 or more intensity levels. The intensity level shall then be transmitted to the LED drivers in the VMS. The controller shall allow the adjustment of display intensity settings under various lighting conditions remotely from the central control software.
* The intensity control mode, manual or automatic, shall be settable via NTCIP using the control software and via the front panel interface. The manual brightness level shall be settable via the software and front panel. The mode and brightness level shall be monitored from both the software and front panel interfaces.

1. Permanent Messages

* HCMS controller(s) shall have the ability to store and activate NTCIP compliant permanent messages. A software utility or other means shall be provided to remotely download permanent message and support files to the HCMS controller. It shall also be possible to download changeable messages from the central server, store them in the HCMS controller, and display them on the sign.

1. System Status Monitoring and Diagnostic Testing

* The HCMS controller shall be capable of monitoring the status of many of the HCMS components and subsystems in real-time and/or manual modes, depending on the component or system. The following sections detail the status and diagnostic information that shall be provided by the controller. All of this status and diagnostic data shall be available via the front panel LCD screen and shall be transmitted via NTCIP to control software upon request.

1. Message Display Status

The HCMS controller shall be capable of monitoring and displaying the currently active VMS message (if any) on the controller’s front panel LCD display. This display shall be in a WYSIWYG (What You See Is What You Get) format. What is viewed on the HCMS control computer monitor shall be a scaled representation of how a message will appear when it is being displayed on the HCMS. Similarly, after a pixel diagnostic test routine has been run, what you see on the control computer monitor shall be a scaled representation of the functional status of each pixel in the VMS display matrix. This term does not refer to methodologies called “WYSIWYG” (or similar), that simply simulate what is being displayed on a VMS (such as, for example, by not directly monitoring the electrical current flowing through each string of LED’s in all LED pixels). With regards to the rotary drum portion of the display, the HCMS controller shall be capable of monitoring and displaying the current rotational position and displayed face of each drum in the rotating drum portion of the sign.

1. LED Pixel Testing

Upon command from either the front panel control interface or via NTCIP from remote control software, the sign controller shall direct all of the LED modules to perform diagnostic tests of all their pixels. The controller shall then collect and report the results of the pixel testing.

The controller shall also be capable of automatically detecting in real-time the status of each of the display’s pixels and reporting their on/off status. This monitoring shall take place without interfering with the display of data on the VMS face.

1. Rotary Drum Testing

The controller shall be capable of automatically rolling the message drums to each drum face or preset message position, stopping briefly at each position or preset message, and measure the rotational speed, stop point, and angular position for each message change. The drums shall revert back to their original position after completion of the test and the controller shall report the measured test results.

1. Power Supply Operation

The sign controller shall monitor and report the functional status of all regulated DC power supplies located in the HCMS by monitoring diagnostic outputs located on the supplies. The controller shall monitor the output voltage of each power supply and the status of each output fuse. The power supply voltages shall be measured to the nearest tenth of a volt and the fuse status shall be indicated as pass or fail.

1. Fan or Ventilation Operation

The controller shall monitor the status of the fans using a tachometer integrated into each fan and report the status back to the central controller. Alternatively, the controller shall monitor the airflow in the ventilation system and report the status back to the central controller.

1. Door Status

The HCMS controller shall monitor the status of all System Control Cabinet and HCMS doors. The sign controller shall report the open or closed door status back to the central controller.

1. Environmental Conditions

The HCMS controller shall monitor and report the readings of all light, temperature, and humidity sensors installed in the HCMS housing. The HCMS controller shall also monitor and report the internal temperature of the sign controller.

1. Error Notification

* The HCMS sign controller shall be capable of automatically informing a maintenance operator (via the local LCD panel) and the central control system (via NTCIP communication) of the occurrence of important events and subsystem failures.
* All major component and subsystem errors shall be indicated on the controller’s LCD front panel.
* The controller shall be capable of sending event notifications to the central controller in response to regular status polling, a manually initiated status update command, or via SNMP “traps” as allowed by NTCIP. When one of these events occurs, the sign controller shall create a data packet for transmission to the central controller that shall contain details about the event. The transmission of traps shall be governed by the NTCIP standards. The controller shall be configurable to enable or disable the transmission of traps for each event or error type. This configuration shall include the automatic initiation of these traps, including establishing modem connections if appropriate, when the NTCIP network permits transmission initiation by the sign controller.
* The following sections list errors and events that the controller shall report as defined above.

1. Over Temperature Shutdown

The HCMS controller shall continuously monitor the VMS housing’s temperature sensors and shall automatically shut down the VMS if the internal cabinet temperature exceeds a safety threshold. This threshold shall have a default value of +140ºF (60ºC) and shall be configurable at the controller.

If the temperature approaches the threshold, the controller shall reduce the brightness of the VMS sign face. If the temperature continues to increase and exceeds that threshold, the controller shall trigger a warning notification event and blank the face of the sign. The sign face shall remain blank until the temperature begins to drop. As the temperature drops, the controller shall gradually increase the brightness of the display face, eventually returning to normal brightness.

The sign controller shall employ an algorithm to control the above brightness reductions and increases utilizing hysteresis to ensure that the display face does not visibly flicker as the temperature changes.

The event notifications sent for over temperature situations shall include visual indication on the controller’s front panel LCD, as well as a trap notification sent to the central control system.

1. Controller Restart

When the HCMS controller detects that it has been restarted due to a manual reset or error condition, it shall send a trap notification to the central controller. It shall also automatically activate the NTCIP reset message if it is configured to do so.

1. Power Loss

When the HCMS controller detects that it has lost power, it shall automatically indicate that on the front panel LCD. It shall also send a trap notification to the central controller and activate the NTCIP power loss message if configured to do so.

1. Power System Failure

The HCMS controller shall automatically monitor the major power systems in the sign and detect when one of them has failed. These failures shall be reported on the front panel LCD and transmitted to the central controller if configured to do so.

1. Door Open

When the sign controller detects that one of the sign cabinet or control cabinet doors has been opened, it shall transmit a trap to the central controller indicating which door has opened.

1. Communication Loss

The HCMS controller shall monitor the frequency of communication packets from the central controller. If the controller detects that communication has not occurred between the sign controller and central controller for longer than a configurable timeout, then the sign controller shall automatically activate a communication loss message as defined by NTCIP. This communication loss message shall be configurable and may be disabled as allowed by NTCIP.

1. Auxiliary Control

The HCMS shall include auxiliary control capability that will provide a secondary user interface for HCMS control, configuration, and maintenance from the System Controller Cabinet and the sign housing. The auxiliary control interface shall meet the same electrical, mechanical, and environmental specifications as the HCMS controller except that it shall communicate with the primary sign controller, not with the central controller.

1. Interface

The auxiliary control location shall offer identical functionality as is available at the primary controller. Regardless of placement of the primary controller, the local SCC cabinet shall include an LCD panel and keypad. It shall also contain a local/remote switch, a reset switch, status LEDs, and one NTCIP compatible serial communication port that meet the same specifications as the HCMS controller. The interface from a location other than the SCC may use a software interface via a secure connection from a technician’s laptop computer in lieu if a matching keypad and LCD display.

1. HCMS Control Interface

The auxiliary control interface shall include an identical menu system to the HCMS controller with all of its features and functionality.

1. Location

If the primary sign controller is located in the SCC, the auxiliary control location shall be located inside the HCMS cabinet to facilitate operation by maintenance workers while working on the HCMS. If the primary sign controller is located in the sign cabinet, the auxiliary control location shall be located in the SCC to facilitate sign operation while working in the SCC.

1. Controller Signal Interface

The auxiliary control location shall interface to the HCMS controller using either outdoor rated fiber optic cable, outdoor rated and surge protected twisted pair cable, or a secure wireless connection. It shall be capable of operating up to 1000 feet from the HCMS controller.

1. Virtual Auxiliary Control

As an acceptable alternative to the physical auxiliary controller specified above, a Virtual Auxiliary Control (VAC) application may be furnished and shall be capable of locally communicating and controlling the VMS controller from a laptop computer or an Android OS smart phone. The VMS controller shall communicate with the application over encrypted Wi-Fi using AES-256 encryption. The VAC application shall include a graphical user interface with all of the configuration, operation, and diagnostic functions and features available from the VMS controller interface.

The VAC Wi-Fi access point shall be located in the SCC. It shall have an operating temperature range meeting or exceeding that of the sign controller and it shall have an internal antenna capable of communicating with a device located on or near the VMS structure. The Wi-Fi access point shall be fully compatible with the Authority’s Cisco network management software.

1. Coordinated Operation of Double Signs

The sign controller shall be capable of being controlled from the central controller or a laptop computer. Each sign controller shall be capable of controlling one entire HCMS consisting of one LED VMS and one or two drum rotors. Where there are two HCMS to be installed on a single structure (2 signs per location), it is essential that the two HCMS controllers be electronically interconnected such that one single message command can control both signs, since these sign messages are typically coordinated at ramp or mainline splits, for traffic operations. This electronic interlocking may be done locally as designed by the HCMS Manufacturer, or through the use of a single controller capable of controlling a combined total of 2 LED VMS and 4 drum rotors.

1. Local Manual Control

Local manual control is essential for HCMS operation with respect to maintaining critical messages under either emergency operations or maintenance of the HCMS.

Local manual/emergency operation shall be based on four required levels of local control as follows:

1. Level 1 Drum Control

The lowest level of local manual/emergency control shall be to turn the drums through the use of a handcrank. Handcrank operation shall be capable by mechanically, and simply releasing the drum brake at the rear of the sign and inserting the provided handcrank into the gear assembly for manual rotation. This should only be accomplished with power removed to the drum motor. VMS operation should still be possible without disruption.

1. Level 2 Drum Control:

The next level of local manual control shall be to electrically control each individual drum through a series of switches within the drum control compartment of the sign. Drum switch control shall include the ability to select a specific drum and continuously rotate it to any position. It shall also be possible to select a specific drum face and have the drum rotate and stop at the selected face. This level of control is mainly intended for maintenance and calibration purposes. Level 2 control is only intended to operate the CMS portion (rotary drums) of the HCMS and should not affect VMS operation in any way, even if a VMS message is currently displayed.

1. Level 3 Drum and VMS Control

The next level of local manual/emergency control shall be to turn the drums and operate the VMS through the keypad and display of the primary or auxiliary control interface. It shall be possible to select and display preconfigured messages on the CMS and VMS portions of the HCMS through the local controller user interface. This level of control is mainly intended for diagnostic purposes.

1. Level 4 Drum and VMS Control

The highest level of local control is through local message selection switches for complete and simple local operation of the HCMS for various roadway closures or emergency conditions without relying on access or knowledge of the master controller. The local control switches shall be accessible through a small switch compartment door installed in the front door of the SCC. The local control compartment shall include a master activation pushbutton switch and six (6) pushbutton message selection switches. The drums should turn and stop in the correct position and the VMS display should change to the correct message after the master switch and a single message selection switch are simultaneously depressed for several seconds. A laminated graphic representation of the programmed messages and associated selection switches shall be attached inside the manual control compartment for reference. This level of control is intended for when there is a communications failure between the sign and central controller.

**Normal HCMS Operation**

|  |  |  |  |
| --- | --- | --- | --- |
| Means | User Interface | Controls | Position Control |
| Remote Control | Central Control Software | CMS/VMS combined | Yes |
| Local Control (at SCC) | n/a | n/a | n/a |
| Local Control (at Rear of Sign) | n/a | n/a | n/a |
| Handcrank | n/a | n/a | n/a |

**Local Operation (Level 1) - Manual Drum Control**

|  |  |  |  |
| --- | --- | --- | --- |
| Means | Interface | \*Controls | Position Control |
| Remote Control | n/a | n/a | n/a |
| Local Control (at SCC) | n/a | n/a | n/a |
| Local Control (at Rear of Sign) | n/a | n/a | No |
| Handcrank | n/a | CMS Single Drum | No |

\*VMS continues to operate normally

**Local Operation (Level 2) - Manual Motor Control**

|  |  |  |  |
| --- | --- | --- | --- |
| Means | Interface | \*Controls | Position Control |
| Remote Control | n/a | n/a | n/a |
| Local Control (at SCC) | n/a | n/a | n/a |
| Local Control (at Rear of Sign) | Internal Switches | CMS Single Drum | Yes and No |
| Handcrank | n/a | n/a | n/a |

\*VMS continues to operate normally

**Local Operation (Level 3) – Local HCMS Message Control**

|  |  |  |  |
| --- | --- | --- | --- |
| Means | Interface | \*Controls | Position Control |
| Remote Control | n/a | n/a | n/a |
| Local Control (at SCC) | Controller Keypad | CMS/VMS Combined | Yes |
| Local Control (at Rear of Sign) | Controller Keypad | CMS/VMS Combined | Yes |
| Handcrank | n/a | n/a | n/a |

**Local Operation (Level 4) – Local HCMS Message Control**

|  |  |  |  |
| --- | --- | --- | --- |
| Means | Interface | \*Controls | Position Control |
| Remote Control | n/a | n/a | n/a |
| Local Control (at SCC) | Switch Compartment | CMS/VMS Combined | Yes |
| Local Control (at Rear of Sign) | n/a | n/a | n/a |
| Handcrank | n/a | n/a | n/a |

918.58 End Node Radio

This Subsection is deleted and replaced with the following:

The End Node Radio shall consist of an enterprise-class, outdoor, software-defined, TCP/IP wireless subscriber terminal operating in the 4940-5875 MHz band for PMP and PTP applications. The radio shall be fully compatible with Redline RDL-3000 Ellipse base stations, including auto-acquire and remote configuration features. The specified End Node Radio Equipment will serve as an extension to the Authority’s existing proprietary broadband wireless Wide Area Network and shall consist of one-each of the items listed in the Supplemental QPL. No substitutions will be allowed without written approval from the Authority’s Integrated Technology Services Department.

1. End Node Radio

Refer to the QPL for approved suppliers.

1. End Node Radio, Enterprise Software Key

Refer to the QPL for approved suppliers.

1. End Node Radio, Indoor Injector

Refer to the QPL for approved suppliers.

1. End Node Radio, AC Power Cord

Refer to the QPL for approved suppliers.

1. End Node Radio, Surge Protector

Refer to the QPL for approved suppliers.

Add the following Subsection(s):

918.59 Surge Protective Devices

The surge protective device shall be as described in the Contract Plans. Installation of the device shall be performed by the Contractor. The surge protective device shall be a Type 1 or Type 2 Surge Suppression Device and shall be UL listed, Standard 1449, Third (3rd) Edition.

1. Electrical Requirements
   1. The Maximum Continuous Operating Voltage (MCOV) shall not be less than 125% of the nominal system operating voltage.
   2. The suppression system shall incorporate thermally protected metal-oxide varistors (MOVs) as the core surge suppression component. The system shall not utilize silicon avalanche diodes, selenium cells, air gaps, or other components that may crowbar the system voltage leading to system upset or create any environmental hazards.
   3. Protection Modes – The SPD must protect all modes of the electrical system being utilized. The required protection modes are indicated by bullets in the following table:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Protection Modes | | | |
| Configuration | L-N | L-G | L-L | N-G |
| Wye | • | • | • | • |
| Delta | N/A | • | • | N/A |
| Single Split Phase | • | • | • | • |
| High Leg Delta | • | • | • | • |

* 1. Nominal Discharge Current (In) – All SPDs applied to the distribution system shall have a 20kA In rating regardless of their SPD Type (includes Types 1 and 2) or operating voltage.
  2. ANSI/UL 1449 3rd Edition Voltage Protection Rating (VPR) – The maximum VPR for the device shall not exceed the following:

|  |  |  |  |
| --- | --- | --- | --- |
| Modes | 208Y/120 | 480Y/277 | 600Y/347 |
| L-N; L-G; N-G | 700 | 1200 | 1500 |
| Delta | 1200 | 2000 | 3000 |

1. SPD Design
2. The SPD shall be maintenance free and shall not require any user intervention throughout its life.
3. The surge current shall be equally distributed to all MOV components to ensure equal stressing and maximum performance. The surge suppression platform must provide equal impedance paths to each matched MOV.
4. Each unit shall include a high-performance EMI/RFI noise rejection filter. Noise attenuation for electric line noise shall be up to 50 dB from 10 kHz to 100 MHz using the MIL-STD-220A insertion loss test method.
5. No plug-in component modules or printed circuit boards shall be used as surge current conductors. All internal components shall be soldered, hardwired with connections utilizing low impedance conductors.
6. Each SPD shall provide the following integral monitoring options:
   1. Each unit shall have a green / red solid-state indicator light that reports the status of the protection on each phase.
   2. Provide Form C dry contacts (one NO and one NC) for remote annunciation of its status.
   3. The SPD shall contain an audible alarm that will be activated under any fault condition. There shall also be an audible alarm silence button used to silence the audible alarm after it has been activated.
   4. The SPD shall be equipped with an LCD display that indicates to the user how many surges have occurred at the location. The surge counter shall trigger each time a surge event with a peak current magnitude of a minimum of 50 ± 20A occurs. A reset pushbutton shall also be standard, allowing the surge counter to be zeroed. The reset button shall contain a mechanism to prevent accidental resetting of the counter.
   5. The unit shall contain thermally protected MOVs. The thermal protection element shall disconnect the MOV(s) from the system in a fail-safe manner should a condition occur that would cause them to enter a thermal runaway condition.
   6. All of the SPD’s components and diagnostics shall be contained within one discrete assembly.
   7. Sidemount SPDs shall be factory sealed in order to prevent access to the inside of the unit. Sidemount SPDs shall have factory installed phase, neutral, ground and remote status contact conductors factory installed and shall have a pigtail of conductors protruding outside of the enclosure for field installation.

918.60 Anti-Seize Compound

Anti-seize compound shall be marine grade non-metallic compound to inhibit galvanic corrosion and prevent fasteners from fusing together from oxidation. Application shall be a paste and shall conform to MIL-PRF-907F or later. The Contractor shall apply anti-seize compound in the field as per manufacturer’s instructions. Anti-seize compound and application thereof shall be incidental to the cost of the attachment hardware.

918.61 Precast Reinforced Concrete Junction Box

Precast reinforced Junction Box (also Junction Box Foundation) frame and cover shall be as detailed in the Standard Drawings, with split cover and handle for each side. Frame shall be gray iron ASTM A48, class 30B, hot dipped galvanized in accordance with ASTM A153. Frame shall be supplied with a copper one-hole ground lug secured with a 3/8 inch diameter x 16 NC Type 304 stainless steel bolt and lock washer (in accordance with ASTM A193, Grade B8). Cover shall be ductile iron ASTM A536, Grade 65-45-12, hot dipped galvanized in accordance with ASTM A153. Cover shall have a load rating that meets or exceeds AASHTO H20-44. Installation aids and hardware shall be incidental to the cost of the junction box, junction box foundation, or.

1. Frame and Cover

As detailed in the Standard Drawings.

1. Lifting Tools

Lifting tools shall be provided at a quantity of two. [Note to Designer: Two is the minimum; revise as necessary]

918.62 Manual Transfer Switch with Generator Docking Station

Manual Transfer Switch with integrated external Generator Docking Station (MTS-DS) (MTS) shall consist of (2) two mechanically interlocked molded case circuit breakers, cam-style male connectors, power distribution block, solid neutral plate, and grounding terminals, all housed within a padlockable enclosure. Current rating and number of poles as indicated on drawings. An External Generator Docking Station (GDS) will be same construction of the MTS-DS, but without the MTS portion. The GDS

The MTS-DS enclosure shall be Type 3R, constructed of continuous seam-welded, stainless steel. The main access shall be through an interlocked, hinged door that extends the full height of the enclosure. Access for portable generator cables with female cam-style plugs shall be via cable entry openings in the bottom of enclosure. A hinged flap door shall be provided to cover the cable openings when cables are not connected; the hinged flap door shall allow cable entry only after the main access door has been opened.

Cam-style male connectors (inlets) shall be UL Listed single-pole separable type and rated 400 amps at 600VAC. Cam-style male connectors shall be color coded. Cam-style male connectors shall be provided for each phase and for ground and shall also be provided for neutral unless otherwise noted. Each of the phase cam-style male connectors within the enclosure shall be factory-wired to a molded case circuit breaker. The ground cam-style male connectors shall be bonded to the enclosure, and a ground lug shall be provided for connection of the facility ground conductor. The neutral cam-style male connectors shall be factory wired to a power distribution block. None of the cam style male connectors shall be accessible unless both molded case circuit breakers are in the “OFF” position and the main access door is open.

A power distribution block shall be provided for load-side field wiring. The power distribution block shall be factory wired to the molded case circuit breakers.

Molded case circuit breakers shall be UL Listed, and the short circuit interrupt rating shall be a minimum of 35kAIC at 480VAC. Trip rating of the molded case circuit breakers shall be as shown on the drawings. One molded case circuit breaker shall be fed from normal power; the other molded case circuit breaker shall be fed from the cam-style male connectors to supply power from a portable generator. Both molded case circuit breakers shall include UL Listed door-mounted operating mechanisms, preventing the opening of the main access door unless both breakers are in the “OFF” position. Both molded case circuit breakers shall be mounted behind a deadfront panel. The load-side of the molded case circuit breakers shall not be energizable unless the main access door is closed and one of the molded case circuit breakers is in the “ON” position. The (2) molded case circuit breakers shall be safety interlocked by mechanical means to ensure that only one breaker may be energized at any given time.

918.63 Vibration Damping Pads

The vibration damping pads shall be furnished in 1/2- inch thickness accurately cut to the dimensions shown on the plans. The pads shall consist of a high quality fabric and rubber body. The pad shall be made with new unvulcanized rubber and unused fabric fibers in a random distribution of proper proportions to maintain strength and stability

The surface hardness expressed in standard rubber hardness figures shall be 30 Shore A Durometer plus or minus 10 durometer average.

The average deflection of a 2 inches x 2 inches x ½ inch thick specimen of the vibration damping pad shall be as follows:

Load (PSI) Deflection (in)

200 0.013

400 0.027

600 0.040

800 0.052

1000 0.065

1200 0.077

1400 0.088

A deflection tolerance of 15% is allowable:

The ultimate breakdown limit of the pad under compressive loading shall be no less than 7000 psi for the specified thickness without extrusion or detrimental reduction in thickness.

The composite washers shall be furnished in 3/8-inch thickness x 1-inch I.D. x 2 ¼ inch O.D. The washers shall consist of 21 plies of 8 oz. of cotton duck impregnated with high quality natural rubber. The Shore Durometer hardness of the composition shall be about 90. The breakdown stress for compression perpendicular to the plane of fabric shall be not less than 17000PSI. One composite washer shall be provided for each anchor bolt.

The base plate anchor bolts with nuts shall be 1 inch diameter hex head stainless steel of such length to ensure proper placing of lamppost damping pads and all washers.

The stainless steel washers shall be 1-1/16 inches I.D. x 2 ¼ inches O.D. x 3/16 inches thick. Three stainless steel washers shall be provided for each anchor bolt.

918.64 Navigation Lighting, Solar

Navigation Lighting shall be specifically designed to clearly mark bridges and structures extending over navigable waterways as found in 33 CFR § 118. Where required by the United States Coast Guard (USCG) navigation lighting including LED fender and LED channel marker lights shall be solar powered with battery backup. Navigation lighting shall conform to 33 CFR § 60 and 33 CFR § 118. Navigation lighting shall include a lantern unit and self-contained solar powered assembly housed in a weatherproof enclosure including solar array, sealed battery, and charge controller. The lantern power supplies shall be available individually and are suitable for powering up to 12 sectored bridge light heads. Power supplies shall be provided with solar power calculations from the manufacturer, showing that autonomy requirement is met or exceeded.

The lantern unit shall be IP68 waterproof and operate via nominal 12VDC with integrated circuit protection and operating temperature range between -40° to 80°C, colors as defined by 33 CFR § 118, and shall be configured steady-on with 24-hour operation. Any internal dawn-to-dusk or other photocell shall be bypassed by the factory such that it may not be inadvertently activated upon or after installation. The lantern unit visibility requirement shall be 2 nautical miles (NM), measured as in 33 CFR § 118.60. Lantern units shall have horizontal output of 180° or 360°, depending on plan requirements and vertical divergence of nine degrees (9°). The lantern unit construction shall be of all corrosion resistant materials with UV-stabilized polycarbonate lenses.

The navigation lighting shall have the option of a self-contained solar powered assembly housed in a weatherproof enclosure including a solar array with adjustable mount. The enclosure shall have hinged captive latches and shall open away from the parapet without obstruction. The solar panel mounting shall allow the panel to rotate and tilt and shall be oriented to face solar south and tilted such that snow and debris are less likely to accumulate. The self-contained solar power supply shall be able to be mounted away from the lantern unit and connected via heavy-duty SOOW power cabling.

Navigation lighting solar power array shall be configured and installed per manufacturer’s direction and approved by the Engineer.

918.65 Wire Labels

Wires shall be labeled in all JBs, JBFs, manholes, load centers, splice cabinets, meter cabinets an enclosure. Brass tags are no longer used and shall be replaced with plastic wire marker (tags) as follows:

* Polyethylene tags shall be black letters on yellow, 1-inch high and inserted into polyethylene tag holders. Holders are secured to each wire with Ty-Raps or approved equal.

Wire labels shall indicate circuit and phase, VMS, HCMS, or camera (i.e., Cir 2B, Cir 4C, VMS 24HR, HCMS 24HR, Camera 24HR, etc.) and be placed at the top of wire loops in JB’s. The neutral shall be labeled with its corresponding circuit and phase if more than one neutral is present (ex. Cir 2BN).

Section 919 - Landscaping Materials

919.10 Seed

Add the following to the end of the first paragraph of this Subsection:

Seed mixes shall be amended to meet the requirements of the Standards for Soil Erosion and Sediment Control in New Jersey (2017) issued by New Jersey Department of Agriculture and shown on the Contract Documents.

Delete the third paragraph from this Subsection and replace with the following:

The grass seed used shall be the new crops see Contractor shall not use any matting material that contains polypropylene or similar plastics, unless he can prove that no other alternatives are reasonably available. Such use of polypropylene matting shall be approved ahead of time by the Engineer. Contractor shall not use any matting material that contains polypropylene or similar plastics, unless he can prove that no other alternatives are reasonably available. Such use of polypropylene matting shall be approved ahead of time by the Engineer. d and the mixtures to be used shall be consistent with the Standards for Soil Erosion and Sediment Control in New Jersey (2017) issued by New Jersey Department of Agriculture.

Add the following language to the end of this Subsection:

Wildflower seed mixtures shall be as follows:

| Table 919-1 Wildflower Seed Mixture | | | |
| --- | --- | --- | --- |
| Seed Type | Minimum Purity (%) | Minimum Germination (%) | Application Rate (Pounds/Acre) |
| Little Bluestem | 90 | 60 | 15.0 |
| Milkweed | 90 | 60 | 5.0 |
| Goldenrod | 85 | 60 | 3.0 |
| Nurse Grass (oats or annual) rye | 90 | 60 | 1.0 |
| Total |  |  | 24.0 |

| Table 919-2 Wildflower Seed Mixture for Steep Slopes | | | |
| --- | --- | --- | --- |
| Seed Type | Minimum Purity (%) | Minimum Germination (%) | Application Rate (Pounds/Acre) |
| Black-eyed Susan | 90 | 60 | 1.0 |
| Lance-Leaved Coreopsis | 90 | 65 | 4.0 |
| Purple Coneflower | 90 | 60 | 2.0 |
| New England Aster | 90 | 70 | 1.0 |
| Butterfly Weed | 90 | 50 | .5 |
| Tickseed Sunflower | 90 | 50 | .5 |
| Ox-eyed Daisy | 90 | 65 | 1.5 |
| \*Mixed Cosmos | 90 | 75 | 5 |
| Wild Bergamot | 90 | 50 | 2 |
| Sweet Alyssum | 90 | 55 | .5 |
| Sheep Fescue | 90 | 85 | 2 |
| Total |  |  | 20.0 |

\*Recommend Spring Seeding Only.

| Table 919-3 Seed Mixture for Steep Slopes in Pinelands Areas | | | |
| --- | --- | --- | --- |
| Purity Grass Seed Mixture | Minimum Purity (%) | Minimum Germination (%) | Percent of Total Weight of Mixture |
| Festuca Longifolia - Hard Fesuce (broken down equally into 2 different varieties) | 90 | 85 | 40% |
| Festuca Ovina - Sheep Fescue | 90 | 85 | 20% |
| Lolium Perenne - Turf Type Perennial Grass | 95 | 90 | 15% |
| Festuca Rubra SSP. Fallax - Chewings Fescue | 95 | 90 | 10% |
| Aesclepias Tuberosa - Butterfly Weed | 90 | 50 | 5% |
| Coreopsis Lanceolata - Lanced Leaved Coreopsis | 90 | 65 | 5% |
| Andropogon Virginicus - Broomsedge | 85 | 60 | 2% |
| Schizachyrium Scoparium - Little Bluestem | 90 | 60 | 2% |
| Rudbeckia Hirta - Black Eyed Susan | 90 | 60 | 1% |
|  |  | TOTAL | 220lbs/acre |

Tags and/or identification slips clearly denoting all wildflower seeds in the mixture shall be supplied to the Engineer for approval, before sowing.

Straw mulch and binding shall be as specified in Subsection 919.13. Hay mulch shall not be utilized.

919.15 Emulsified Asphalt

Delete this Subsection in its entirety.

919.29 Wire Rope

Add the following language after the end of the first paragraph:

The material shall conform to ASTM A1007 and ASTM A1023.

919.35 Soil Stabilization Matting

Delete this Subsection in its entirety and replace it with the following:

Products submitted under this product type shall have AASHTO Product Evaluation and Audit Solutions test data in accordance with the submission cycles stated in AASHTO’s Erosion Control Products (ECP) & Sediment Retention Devices (SRD) technical committee work plan.

Contractor shall not use any matting material that contains polypropylene or similar plastics, unless he can prove that no other alternatives are reasonably available. Such use of polypropylene matting shall be approved ahead of time by the Engineer.

1. Jute Mesh

Jute Mesh shall be cloth of a uniform plain weave of undyed and unbleached single jute yarn, 48 inches in width plus or minus one inch and weighing an average of 1.2 pounds per linear yard of cloth with a tolerance of plus or minus 5 percent, with approximately 78 warp ends per width of cloth and 41 weft ends per linear yard of cloth. The yarn shall be of a loosely twisted construction having an average twist of not less than 1.6 turns per inch and shall not vary in thickness by more than one half its normal diameter. Jute mesh shall be 100% biodegradable.

1. Excelsior Mat

Delete this Paragraph in its entirety.

1. Straw Blanketing

Straw blanketing shall be comprised of 100% biodegradable jute straw. It shall have a field life of three (3) to twelve (12) months, and shall be selected based on the proposed slope inclination 3 horizontal to 1 vertical (3H:1V) or flatter.

1. Biodegradable Polypropylene

Biodegradable Polypropylene matting material shall be comprised of 100% photodegradable polypropylene or other plastic material when authorized by the Authority. The Authority will consider material that contains polypropylene or other plastic materials only when the proposed slope inclination 3 horizontal to 1 vertical (3H:1V) or steeper and the Contractor proves that no other alternatives are reasonably available. When polypropylene or other plastic material is considered, the material should be photodegradable that contains an accelerant that will cause breakdown of the matting within 6 months and installed as per manufacturer’s recommendation.

| Table 919-4 Soil Stabilization Matting Properties for Biodegradable Polypropylene Matting | |
| --- | --- |
| Index-Test Method | Value |
| Mass per Unit Area-ASTM D 6475 | .08 -1 lbs/ SY |
| Ultimate Tensile Strength/Strain-MD-ASTM D 6818 | > 130 lbs/ Ft/ <30% |
| Thickness-ASTM D 6525 | > 0.25 in. |
| Light Penetration- ASTM D 6567 | > 15 % |
| Water Absorption- ASTM D 1117 & ECTC-TASC 00197 | >250% |
| Determination of Unvegetated RECP Ability to Protect Soil From Rain Splash and Runoff Under Bench Scale Conditions-ASTM D 7101 | Soil Loss Ratio < 20% |
| Determination of Temporary Degradable RECP Performance in Encouraging Seed Germination and Plant Growth- ASTM D 7322 | >550% |

[Include the following with Contracts including Retaining Wall System:]

919.47 Retaining Wall System

Add the following language to the end of this Subsection:

Paragraph (F) is renamed to “Retaining Wall Concrete Adhesive.”

919.51 Hydromilling

Delete this entire Subsection and replace it with the following:

Hydromilling shall be performed by use of a mobile, high-pressure water jetting system with the operating pressure of 40,000 psi, maximum flow of 13 gpm and maximum nozzle rotation speed of 3000 rpm.

Section 920 – Traffic Control Devices

920.04 Flashing Lights

Delete the entire Subsection and replace it with the following:

Flashing lights shall be amber color, minimum six-inch diameter, battery powered LED lights. The lights shall be capable of being mechanically mounted or affixed to concrete barrier in accordance with the manufacturer’s instructions so as to withstand passing traffic and wind/weather without becoming detached.

920.05 Batteries

Delete the entire Subsection and replace it with the following:

Batteries shall not contain mercury or cadmium. Batteries shall be lantern type with a minimum life of 30 days under continuous flashing operation. Batteries shall be capable of being fully recharged in no more than one hour from a completely discharged condition.

920.06 Signs and Overlay Panels

Delete Paragraph (B) and replace it with the following:

1. Non-Reflective Sign Lettering, Symbols and Border

Non-reflective sign lettering, symbols and border shall be opaque black vinyl with glossy finish and from the QPL, or an approved equal. Application may be either prior to or after sheeting application. Each sign panel shall also have the Authority identification, as shown on the Plans.

920.07 Folding Sign Stands

Add the following language to the end of this Subsection:

Folding sign stands shall be designed to securely hold wood, aluminum or roll-up signs, and shall include top and bottom brackets to secure the sign. The stand shall include springs and/or dampers to resist signs from coming loose in winds up to 90 mph. The crash performance of the sign stand shall demonstrate that the sign and stand do not become projectiles that may enter the vehicle when struck.

920.08 Concrete Barrier

Delete the second paragraph and replace it with the following:

Concrete construction barrier and interlocking devices shall be in accordance with the Traffic Protection (TP) Standard Drawings. The Contractor may submit alternate barrier systems with interlocking devices that meet MASH 2016 – Test Level 3 requirements to the Engineer for review and approval. An alternate barrier system submitted for approval must demonstrate that the maximum dynamic deflection of the alternate barrier system observed during MASH crash testing shall not exceed the minimum required clear area of the standard concrete barrier system joint class specified by the contract plans. Documentation of successful MASH crash testing by a certified testing facility shall be provided as a condition of an alternate barrier system approval. The approval of an alternate barrier system is solely at the discretion of the Engineer and will consider the minimum required clear area behind the barrier, installation requirements, and a general assessment if the alternate barrier system is in the Authority’s best interest. If an alternate barrier system is accepted by the Engineer, the installation of the alternate barrier system shall be in conformance with conditions under which the barrier system demonstrated MASH crash testing compliance. Approved or rejected substitutions shall be at no additional cost to the Authority.

920.09 Flags

Add the following language to the end of this Subsection:

The reflective sheeting shall meet the following minimum performance criteria:

| Criterion | Coefficient of Reflection | Reference |
| --- | --- | --- |
| Initial reflectivity (5° entrance angle, 0.2° observation angle) | 500 average, 330 minimum | ASTM E908-08, ASTM E810-03 |
| Abrasion | 100 | CEN – EN 530 Method 2 |
| Flexing | 100 | ISO 7854 Method A |
| Cold fold | 100 | ISO 4675 |
| Wet reflectivity | 100 | ANSI/ISEA 107-2015 |

920.10 Removable Wet Weather Pavement Marking Tape

Delete the third paragraph and Notes (A) through (D) and replace it with the following:

When measured with a handheld retroreflectometer the tape shall have initial, minimum retroreflectance values conforming to:

1. Dry Condition – ASTM E 1710

Entrance Angle = 88.76°

|  |  |  |
| --- | --- | --- |
| Observation Angle | Specific Luminance | |
| (Degrees) | White (Millicandelas per square foot per footcandle) | Yellow (Millicandelas per square foot per footcandle) |
| 1.05 | 500 | 300 |

Note: The angular aperture of both the photoreceptor and the light projector shall be six minutes of arc. The reference axis shall be taken perpendicular to the test sample.

1. Continuous Wet Condition – ASTM E 2176

Entrance Angle = 88.76°

|  |  |  |
| --- | --- | --- |
| Observation Angle | Specific Luminance | |
| (Degrees) | White (Millicandelas per square foot per footcandle) | Yellow (Millicandelas per square foot per footcandle) |
| 1.05 | 250 | 200 |

920.11 Arrow Board

Replace requirement (B) with the following:

1. A minimum peak luminous intensity of 1,000 candela and equipped with photocells that will automatically reduce the luminous intensity to 750 candelas when the ambient light level drops.

Replace the first paragraph after the list of requirements with the following:

Flashing arrow boards shall be equipped with a solar charged battery system. Do not use gasoline powered systems. Securely mount flashing arrow boards on a manufacturer approved 2-wheeled towing trailer.

920.13 Vehicle Lights

Delete the entire Subsection and replace it with the following:

Vehicle lights shall consist of a minimum of two six-inch diameter flashing or rotating amber lights mounted on or above the top of the vehicle such that they are visible from a 360-degree angle. Lights shall appear to turn on and off regularly from any viewing direction at a rate of 60 to 260 cycles per minute. Flashing lights shall achieve full brightness during each cycle.

920.15 Temporary Impact Attenuator

Delete the entire Subsection and replace it with the following:

Temporary Impact Attenuators shall be a MASH compliant system from the QPL. All materials shall be as specified by the device manufacturer in compliance with the MASH conforming configuration.

The impact attenuator system shall conform to MASH Test Level 3 (TL-3). MASH compliance shall include a FHWA Federal Aid eligibility letter, if issued by the FHWA, and documentation of MASH compliance including crash test videos, crash test results and/or analysis. Installation and materials shall conform to the manufacturer’s detailed drawings and instructions used to determine MASH compliance.

Impact attenuators used in a construction zone on a temporary basis may be either re-directive or non-redirective as indicated on the Plans. Re-directive devices shall conform to the requirements of 920.20 Redirective Impact Attenuator.

Components from multiple systems shall not be intermixed.

Sand placed in the modules should be washed concrete sand conforming to ASTM C-33 or equal.

920.16 Traffic Pylons

Add the following language to the end of this Subsection:

The high-intensity wraps shall be silver (white) retroreflective sheeting meeting the requirements of ASTM D-4956, Type III.

920.17 Modular Glare Screen System

Delete the first and second paragraph and replace it with the following:

Modular Glare Screen System shall be from an approved supplier as listed on the QPL. The panels shall be 6 inches wide with a height of 24 inches and shall be mounted to the top of the barrier as per the instructions of both the system manufacturer and the barrier manufacturer as applicable. The panels shall be FHWA highway green in color.

Reflective tape three (3) inches wide and six (6) inches high shall be applied to the blades every ten (10) feet. The tape shall be high intensity grade reflective sheeting. The tape color shall be white when traffic is to the left and yellow when traffic is to the right. Tape shall be applied vertically centered on the blade on the edge closest to passing traffic.

920.18 Truck Mounted Attenuator

Delete the Subsection and replace it with the following:

The truck mounted attenuator (TMA) shall be a MASH compliant system from the QPL. All materials shall be as specified by the device manufacturer in compliance with the MASH conforming configuration.

The truck shall be in excellent operating condition and have a minimum gross weight in accordance with the TMA manufacturer’s recommendation. The truck shall be equipped with vehicle lights in accordance with Subsection 920.13 and the appropriate generator to power the truck and attenuator lights. The truck lights shall be mounted so that they are visible when the attenuator is in a raised position. The truck shall be equipped with a rear-mounted attenuator, including a crushable energy absorption module, cartridge support cables, lightweight steel backup plate, corner jacks, hydraulic tilting system and the hardware necessary for attachment.

The truck mounted attenuator shall conform to MASH Test Level 3 (TL-3). MASH compliance shall include a FHWA Federal Aid eligibility letter, if issued by the FHWA, and documentation of MASH compliance including crash test videos, crash test results and/or analysis. Setup and materials shall conform to the manufacturer’s detailed drawings and instructions used to determine MASH compliance.

The attenuator shall have a minimum of 72 square inches of high intensity orange retroreflective sheeting toward the extremities on each side of the equipment. A minimum of 144 square inches of the sheeting shall be visible from each direction. The rear facing of the attenuator shall have 4-inch-wide black stripes on high intensity retroreflective yellow sheeting in an inverted chevron pattern. All retroreflective sheeting shall meet the requirements of ASTM D-4956, Type III. The attenuator shall have a standard trailer lighting system, including brake lights, taillights, turn signals and ICC bar lights. The truck mounted attenuator shall be attached to the truck in accordance with the manufacturer’s instructions, including hydraulic tilting system and backup structures.

Components from multiple attenuator systems shall not be intermixed.

920.20 Non-Gating, Re-Directive Impact Attenuator

Delete the entire Subsection and replace it with the following:

Re-directive impact attenuators for temporary and permanent installations shall be a MASH compliant system from the QPL. All materials (attenuator system, transitions, backplates, connection hardware) shall be as specified by the device manufacturer in compliance with the MASH conforming configuration.

The impact attenuator system shall be a re-directive device that conforms to MASH Test Level 3 (TL-3). MASH compliance shall include a FHWA Federal Aid eligibility letter, if issued by the FHWA, and documentation of MASH compliance including crash test videos, crash test results and/or analysis. Installation and materials shall conform to the manufacturer’s detailed drawings and instructions used to determine MASH compliance.

Components from multiple systems shall not be intermixed.

Add the following Subsection:

920.21 Cone Truck

The cone truck shall be in excellent operating condition and be a FHWA rated Class 5 (or greater) vehicle (minimum vehicle weight of 17,600 lbs.) from the QPL or approved equal.

1. Truck Requirements

The truck shall be equipped with:

1. A minimum eight (8) foot wide by minimum sixteen (16) foot long steel or aluminum bed for the storage of cones, signs and other traffic control devices as warranted. The perimeter of the bed shall be defined by stakes with a top rail that is a minimum of 32 inches above the bed.
2. Spotlighting that to the extent practicable, the spotlighting illuminance shall be contained to the steel or aluminum body so that this lighting is not exposed or directed to traffic.
3. A rear-mounted basket for workers that allows for the deployment of traffic control devices to both the left- and right-side of the cone truck. The rear mounted worker basket shall not interfere with or obstruct the vehicle brake lights, taillights, or turning lights.
4. A communication system that facilitates direct communication between the workers, observer, and driver.
5. Storage and restraint systems for 48-inch by 48-inch signs and portable sign stands.
6. Conspicuity retroreflective sheeting or tape that is in a red and white alternating pattern. The conspicuity treatment system shall be positioned as horizontally as practicable, beginning, and ending as close to the front and rear of the cone truck as practicable and observable by approaching traffic. The conspicuity treatment system is not required to be continuous. However, the sum of the length of all visible segments must be at least half of the length of the overall steel or aluminum body and, if applicable, any spaces between the segments of the retroreflective sheeting or tape must be distributed as evenly as practicable.
7. Worker Basket Requirements

The worker basket shall allow for the deployment of traffic control devices to both the left- and right-side of the cone truck. The worker basket shall include:

1. A rail system that is a minimum height of 32 inches (from floor of the basket) and the rail shall be capable of withstanding, without failure, a force of at least 200 pounds applied in any downward or outward direction.
2. Non-slip flooring or other system of traction control for standing workers.
3. Conspicuity treatment system of retroreflective sheeting or tape. The conspicuity treatment system is not required to be continuous. However, if applicable, any spaces between the segments of the retroreflective sheeting or tape must be distributed as evenly as practicable.

The conspicuity treatment system for the framing of the worker basket viewed by oncoming traffic is in addition to alternating red and white conspicuity markings that are required to the rear or lower rear of the vehicle in accordance with conspicuity requirements for commercial motor vehicles established by the Federal Motor Carrier Safety Administration.

Add the following Subsection:

920.22 Portable Longitudinal Steel Barrier

Portable longitudinal steel barrier systems shall be MASH compliant systems from the QPL. The MASH compliant system shall conform to MASH Test Level 3 (TL-3). MASH compliance shall include a FHWA Federal Aid eligibility letter, if issued by the FHWA, and documentation of MASH compliance including crash test videos, crash test results and/or analysis.

Installation and materials shall conform to the manufacturer’s detailed drawings and instructions used to determine MASH compliance of the portable longitudinal steel barrier system. The nominal length of the steel barrier sections shall be adjusted to accommodate curved barrier alignments as specified by the manufacturer, down to the allowable minimum curve radius as determined by the manufacturer. Components from multiple barrier systems shall not be intermixed.

When used in lieu of concrete construction barrier as specified in Subsection 920.08, the maximum dynamic deflection of the portable longitudinal steel barrier system shall not exceed the minimum required clear area of the concrete barrier system joint class specified by the contract plans and as defined on the TP Standard Drawings. The equivalent anchorage treatment to achieve the minimum clear area of the required joint class shall be as per the manufacturer’s instructions.

Portable longitudinal steel barriers shall be provided with delineators mounted on the side of the barrier as per the manufacturer’s instructions at twenty (20) foot intervals. The side mounted delineators shall be yellow when the construction barrier is to the left of traffic and white when the construction barrier is to the right of traffic. Delineators shall also be mounted on the top of the steel barriers as per the manufacturer’s instructions at 100-foot intervals on tangent sections, curves of radii greater than 1,910 feet, and at 50-foot intervals on curves of 1,910 feet or less. Delineators shall be provided in accordance with Subsection 923.18.

On tapered portions of portable longitudinal steel barrier, flashing lights shall be mounted instead of delineators as per the manufacturer’s instructions. One flashing light is to be mounted at the beginning of the taper and additional flashing lights are to be mounted at forty (40) foot intervals. The flashing lights shall be in accordance with Subsection 920.04 and shall be operational twenty-four (24) hours a day.

Section 922 – Toll Booths, Islands, and Canopies

922.02 Booth Shell

1. Panels

Delete the first sentence of the first paragraph and replace with:

Panels shall be stainless steel.

922.04 Internal Electrical Work

1. Booth Lights

Delete the entire Paragraph (D) and replace it with the following:

Booth Lights ‑ Booth light fixtures shall contain four (4) cool white 20-Watt fluorescent lamps, recessed type. The housing shall be 19-gauge steel. The frame shall be stainless steel with Alba glass panels. Wiring sockets, high power factor 120 Volt Type Class P trigger start ballasts to operate the lamps shall be provided. The finish shall be baked white synthetic enamel. Clips shall be provided for mounting in the booth metal ceiling.

922.05 Toll Islands

1. Fire Extinguishers and Mounting Brackets

Delete the entire paragraph and replace it with the following:

Fire extinguishers shall be multipurpose dry chemical (A B C) type portable fire extinguisher. Extinguishers shall have a capacity of 20 pounds with a U/L rating of 20A:120B:C, a replaceable valve stem seal, pressure gauge, pull pin upright squeeze grip operation, with a mounting bracket for outdoor installation on concrete bumper blocks at the required toll islands or other Engineer approved locations.

Section 923 – Miscellaneous

[Include the following with Contracts including Bearing Pads:]

923.02 Bearing Pads

Add the following language to the end of this Subsection:

1. Elastomeric Bearing Pads for Bridge Beams.

Refer to the QPL.

923.04 Canopy Drain

Delete this Subsection and replace with the following:

Canopy drains shall have a cast iron body with combined flashing clamp and gravel stop, 8½ inch diameter flange, with a low-profile polyethylene dome. Drain leader shall be galvanized steel pipe conforming to the requirements of ASTM A53.

923.05 Caulking Compound

Delete this Subsection and replace it with the following:

Caulking compound shall be an aluminum impregnated caulking compound

923.06 Dampproofing And Waterproofing

1. Membrane Waterproofing for Bridge Decks

Delete this paragraph and replace it with the following:

Membrane waterproofing for bridge decks shall consist of primer, preformed membrane sheet and mastic. Membrane waterproofing shall conform to Section ASTM D6153, Type III and all relevant provisions of Section 21 of the AASHTO Bridge Construction Specifications, 4th Edition, except that the minimum air and concrete temperature at time of installation shall be 40 degrees Fahrenheit. The minimum temperature at time of installation shall be 40 degrees Fahrenheit.

1. Epoxy Resin Waterproofing

Delete the first paragraph and replace it with the following:

Epoxy Resin Waterproofing shall consist of a liquid coating of a two component epoxy resin sealing compound and sand to be applied to horizontal concrete as per the requirements listed below. The material shall conform to ASTM C881 and have a water absorption of 0.1% as per ASTM D570 (24-hour immersion).

1. Methacrylate Crack Sealer

Delete the first paragraph and replace it with the following:

The high molecular weight methacrylate (HMWM) resin shall be low viscosity and non-fuming.

The material shall conform to the following requirements:

| Test Requirement | Procedure | Minimum Requirements |
| --- | --- | --- |
| Viscosity | ASTM D2849 | Less than 25 cps |
| Density |  | 8.4 lb/gal @ 77ºF |
| Flash Point |  | 200ºF |
| Vapor Pressure | ASTM D323 | 1mm Hg @ 77ºF |
| TG (DSC) | ASTM D3418 | 136º F |
| Gel Time |  | 40 minutes for 100g mass |
| Percent Solids |  | 90% by Weight |
| Bond Strength | ASTM C882 | 1500 psi |

923.08 Epoxy Bonding Compound

Delete this Subsection and replace it with the following:

Products submitted under this product type shall have AASHTO Product Evaluation and Audit Solutions test data in accordance with the submission cycles stated in AASHTO’s Epoxy Resin Bonding (ERB) technical committee work plan.

The epoxy bonding compound shall be a 2-component, epoxy-resin, bonding system for application to concrete. It shall conform to the requirements of ASTM C881. If used in load-bearing applications, the material shall conform to the requirements of ASTM C881, Type IV or V, Grade 1 or 2, Class B or C as per Project requirements.

No epoxy bonding compound shall be used six months after the date of manufacture.

923.09 Epoxy Mortar

1. Aggregate

Delete the first paragraph and replace it with the following:

Aggregate shall be clean sand consisting of hard angular particles completely free of dust. In hardness it shall be at least equal to a rating of 7 on Mohs Hardness scale. Gradation of the aggregate shall be as follows:

923.18 Delineators

Delete the entire Subsection and replace it with the following:

Retroreflective sheeting for delineators shall be as specified in Section 912.02. Affix yellow, white or red reflective sheeting to the traffic-facing side of the delineator according to the manufacturer’s recommendations. Aluminum backed delineator panels shall meet specifications for signs in Section 912. Drivable flexible delineators and concrete barrier delineators shall meet the following minimum physical requirements:

1. Concrete Mounted Delineators

Concrete barrier delineators shall consist of a polymer or extruded polycarbonate resin base that permits the delineator unit to be side-mounted or top-mounted to concrete barrier, with a flexible joint between the retroreflective portion and the adhesive portion of the unit so that the delineator does not become a projectile when struck. Concrete barrier delineators as specified in Section 801 shall be 3 inches wide by 3 inches high if side mounted and shall be a minimum of 4 inches wide by 8 inches high if top mounted. The minimum thickness shall be 1/8 inch.

1. Drivable Flexible Delineators

Drivable flexible delineator markers shall be made of a fiberglass reinforced, thermosetting, high-density polymer resin or an extruded polycarbonate resin, which are resistant to ultraviolet and infrared radiation. The retroreflective portion of a drivable flexible delineator marker shall be 4 inches wide by 8 inches high and the minimum thickness shall be 1/8 inch. Installation shall be as per manufacturer’s recommendations.

The marker shall meet the following criteria:

1. Design.

The marker shall be a single piece marker capable of simple, permanent installation by one person using a manual driving tool. The marker, upon proper installation, shall resist displacement from wind and vehicle impact forces. The marker shall be of a sufficient cross sectional design to accept retroreflective sheeting with reinforcing support ribs incorporated longitudinally along each edge, to provide sheeting protection and structural rigidity. The bottom end of the marker shall be pointed for ease of ground penetration.

1. Material.

The marker shall be constructed of a durable, UV resistant, continuous glass fiber and marble reinforced, thermosetting composite material which is resistant to impact, ozone, and hydrocarbons within a service temperature range of -40°F to +140°F.

Sheeting and lettering shall be as approved by the Engineer, if not included in Supplementary Specifications.

The marker shall exhibit good workmanship and shall be free of burns, discoloration, cracks, bulges or other objectionable marks which would adversely affect the marker's performance or serviceability. Each marker shall be permanently identified with the manufacturer's name and the month and year of fabrication. The letters shall be a minimum of 3/8-inch in height, and permanently affixed to the rear of the marker. A black line shall be stamped horizontally across the front of the marker near the bottom to indicate proper burial depth.

1. Physical and Mechanical Requirements.

The flexible marker shall conform to the shape and overall dimensions as recommended or supplied by the manufacturer. The nominal marker width shall accommodate a four-inch wide delineator and provide adequate daytime delineation. The marker shall be of such length to provide the required height above the road surface, as per MUTCD, with a minimum embedment of 24 inches.

The marker shall have the minimum mechanical properties as follows:

|  |  |  |
| --- | --- | --- |
| Property | ASTM Test Method | Minimum Value |
| Ultimate Tensile Strength | D 638 | 50,000 psi |
| Ultimate Compressive Strength | D 638 | 45,000 psi |
| Specific Gravity | D 792 | 1.7 |
| Weight % Glass Reinforcement | D 2584 | 50% |
| Barcol Hardness | D 2583 | 47 |

The marker shall be pigmented throughout the entire cross-section so as to produce a uniform color that is an integral part of the material. Ultraviolet resistant materials shall be incorporated in the construction to inhibit fading or cracking of the delineator upon field exposure.

1. Cold Flexibility.

A four-foot tall marker shall be conditioned for a minimum of two hours at -40°F ± 3°F. The unit shall then be held at the bottom end in a vertical position and the top end bent 90 degrees such that it parallels the floor. The marker shall return to within 5 degrees of the upright position within 30 seconds. The bend test shall be repeated three times in quick succession, completing the test within 2.5 minutes of post removal from the conditioning temperature.

1. Cold Impact Resistance.

The marker shall be conditioned a minimum of two hours at -40°F ± 3°F. A minimum two-pound spherical weight shall be dropped a distance of five feet through a virtually frictionless vertical guide to impact the surface of the marker at mid-section. The surface of the post being struck by the steel ball shall be in a horizontal position with the post supported and held in position at both ends. The post shall be subjected to five impact tests concentrated near the middle of the post within 10 minutes from the removal from the environmental chamber. Fracturing, cracking, or splitting of the posts, shall constitute failure.

Another conditioned marker shall be struck flush against a flat solid surface three times within two minutes after removal from the conditioning chamber. To strike the marker, it should be manually swung through a 90-degree arc, and the marker shall not fracture or shatter upon impact.

1. Vehicle Impact Resistance.

The Marker shall be capable of self-erecting and remain functional after being subjected to a series of ten head-on impacts by a typical passenger sedan at 55 mph. The marker shall retain a minimum of 60% of its sheeting.

923.20 Skid Resistant Coating

Delete the second paragraph and replace with:

Coatings shall be a two-component, high solids, epoxy system containing abrasive granules or silica aggregate, applied in two coats. The material shall conform to ASTM C881, Type III (Grade and Class as per Project requirements) and shall have a maximum weight loss of 0.04 grams (1,000 cycles) as per the Taber Abrader test.

923.22 Epoxy Resin System

Products submitted under this product type shall have AASHTO Product Evaluation and Audit Solutions test data in accordance with the submission cycles stated in AASHTO’s Epoxy Resin Bonding (ERB) technical committee work plan.

1. Epoxy Resin for Injection

Delete the first paragraph and replace it with:

Epoxy resin system for injection materials to fill structural voids and cracks shall be a two component, 100% solids, moisture insensitive, high modulus, high strength epoxy resin adhesive. The material shall conform to ASTM C881, Type I or IV, having a minimum compressive strength of 10,000 psi per ASTM D695 and a minimum bond strength of 2,000 psi per ASTM C882.

The pressure injected epoxy shall be capable of penetrating the cracks and voids to their full depth and bond to surfaces of cracked concrete and/or structural steel.

1. Epoxy/Resin/Grout for Anchor Bolts in Nominal Holes

Delete this paragraph and replace it with the following:

Epoxy resin system to injection materials to install anchor bolts in non-tension applications in drilled holes of a nominal diameter shall conform to ASTM C881, Type IV, having a minimum compressive strength of 10,000 psi per ASTM D695 and a minimum bond strength of 2,000 psi per ASTM C882.

1. Epoxy/Resin/Grout for Anchor Bolts in Oversize Holes

Delete this paragraph and replace it with the following:

Epoxy resin system for injection materials to install anchor bolts in non-tension applications in drilled or preformed holes of up to 3”in diameter shall conform to ASTM C881, Type I or IV, having a minimum compressive strength of 10,000 psi per ASTM D695 and a minimum bond strength of 2,000 psi per ASTM C882.

923.23 Epoxy Crack Sealant

Delete this Subsection replace it with the following:

Products submitted under this product type shall have AASHTO Product Evaluation and Audit Solutions test data in accordance with the submission cycles stated in AASHTO’s Epoxy Resin Bonding (ERB) technical committee work plan.

The material shall be an epoxy resin gel and conform to ASTM C881, Type IV or V, Grade 3 and Class C.

923.24 Crack Spanning Membrane

Delete this Subsection in its entirety and replace it with the following:

Crack Spanning Membrane shall be a high-density asphaltic mastic laminated between layers of nonwoven polypropylene meeting the following properties:

|  |  |  |
| --- | --- | --- |
| **Property\*** | **ASTM** | **Requirement** |
| Thickness | ASTM D1777 | 0.135 inch minimum |
| Width | N/A | 20 inches minimum |
| Weight of Membrane | N/A | 0.8 lbs/ft2 minimum |
| Mastic Density | ASTM D70 | 70.0 lbs/ft3 |
| Cold Flexibility, (2” x 5” Specimen 180 deg  Bend on 2 inch Mandrel, 32 deg F) | ASTM D146 (Modified) | No Cracking or Separation |
| Heat Stability, (2” x 5” Specimen 180 deg Hung Vertically in a Mechanical Convention over 2 hrs., 190 deg F) | N/A | No Dripping or Delamination |
| Mastic Softening Point | ASTM D36 | 210 deg F minimum |
| Percent Elongation | ASTM D412 | >10 percent |
| Tensile Strength | ASTM D412 | >1600 psi |
| Puncture Resistance | ASTM E154 | >200 lbs |

\* - Sampling in accordance with ASTM D146

Ensure that the material is applied in accordance with the manufacturer’s instructions.

Crack and joint sealant shall be a hot poured modified asphalt using an elastomer/plastomer blend conforming to Subsection 904.06(A) or an asphalt vulcanized rubber crack sealant conforming to Subsection 904.03.

923.28 Sealant

Delete this Subsection replace it with the following:

Sealant shall be a high performance, moisture-cured, one-compound polyurethane or silicone base elastomeric sealant and shall conform to ASTM C920, Type S, Grade NS, Class 50, Use NT.

923.31 Bonding Agent

Delete the first sentence of the first paragraph and replace it with the following:

The material shall conform to ASTM C881 (grade, class and use as per Project requirements) and have a minimum bond strength of 2,500 psi.

923.32 Anti-Corrosion Coating

Delete the first paragraph and replace it with the following:

The material shall conform to the requirements of ASTM D3963.

923.40 Z-Turn Attenuator

Delete the entire Subsection and replace it with the following:

The attenuators for Z-Turns shall be as specified in Subsection 920.20.

923.46 Raised Pavement Markers and Adhesive

Delete this Subsection in its entirety.

923.47 High Early Strength Patch Mix

Delete this Subsection in its entirety and replace with:

High early strength patch mix for use in emergency and routine roadway and bridge repairs shall be from an approved supplier as listed on the QPL and in accordance with the specifications as set forth in Section 417 Bridge Deck Rehabilitation.

[Include the following with Contracts including Prefabricated Modular Wall Systems:]

Add the following Subsection:

923.48 Prefabricated Modular Wall Systems

Refer to the QPL.

Add the following Subsection:

923.49 Thermoplastic Rumble Strips

Material for thermoplastic rumble strips shall conform to the physical and chemical requirements of AASHTO M 249.

[Include the following with Contracts including MSE walls, as necessary:]

Delete this Section in its entirety and replace it with the following:

Section 925 – Mechanically Stabilized Earth (MSE) Walls

Materials within this section shall conform to the current editions of AASHTO LRFD Bridge Design and Construction Specifications with Interims except as noted herein, and in accordance with provisions of the wall system selected for construction in this contract, as approved by the Engineer.

The following are defined for the allocation of responsibilities as described herein:

“Engineer” shall be as defined in paragraph 101.02(B).

“Wall Manufacturer” shall be defined as the approved MSE wall supplier/vendor and shall also include a Professional Engineer licensed in NJ, responsible for the preparation of the Working Drawings and calculations associated with the MSE Wall.

925.01 Steel Reinforcing Elements

1. Steel Reinforcing Elements
2. Steel wire mesh and embedded loops shop fabricated from cold drawn steel wire shall meet the minimum requirements of ASTM A82. Steel wire mesh shall be welded into the finished mesh fabric in accordance with ASTM A185. This type of Steel Reinforcing Element is also referred to as a “Bar Mat”.
3. Steel strips hot rolled from bars to the required shape and dimensions with physical and mechanical properties meeting ASTM A572/572M Grade 65 or as shown on the approved Working Drawings. Shop-fabricated hot rolled steel tie straps shall meet the minimum requirements of ASTM A1011/A1011 M, Grade 50, or as shown on the approved Working Drawings
4. Corrosion Protection

Steel reinforcing strips, tie strips, reinforcing mesh, connectors and all ferrous materials in direct earth contact used in permanent walls shall have corrosion protection as specified in the most current version of the AASHTO LRFD Bridge Design Specifications, the AASHTO LRFD Bridge Construction Specifications and as shown on the Working Drawings. Galvanization shall be applied in accordance with AASHTO M 111 (ASTM A123) for strip type, bar mat, or grid type reinforcements and ASTM A153 for accessory parts such as bolts and tie strips. Galvanization shall be applied after fabrication in accordance with ASTM A123. All steel reinforcement and connection hardware shall be made from the same metal alloy and galvanized, unless otherwise approved. by

All metallic elements in direct contact with one another shall be of the same alloy and have the same type of coating. Steel-to-steel contact between the soil reinforcement connections and the concrete facing steel reinforcement shall be prevented so that contact between dissimilar metals, e.g., bare facing reinforcement steel and galvanized soil reinforcement steel, does not occur.

If galvanization is scratched or otherwise damage it shall be field repaired as per the requirements of ASTM A780 prior to installation to the satisfaction of the Engineer and in accordance with the manufacturer’s recommendations, at no additional cost to the Authority.

1. Quality Control

The Contractor shall submit the Wall Manufacturer’s written certification that the material was manufactured, sampled, tested, and inspected in accordance with, and meets the requirements specified above and the Wall Manufacturer’s internal quality control process.

Additional Quality Control testing shall be specified in the Working Drawings as deemed necessary by the Wall Manufacturer, including the test designation, acceptable result, and frequency of testing.

1. Quality Assurance

Quality Assurance testing of steel reinforcing elements will be performed if deemed necessary by the Engineer in accordance with 925.01(A).

925.02 Geosynthetic Reinforcing Elements

1. Geosynthetic Reinforcing Elements

The following information for each product shall be submitted by the Wall Manufacturer for verification purposes:

1. Geosynthetic type and structure.
2. Spacing and dimensions of geogrids.
3. Polymer(s) used for fibers, ribs, etc.
4. Polymer(s) used for coating, if present.
5. Roll size (length, width, area, and weight .
6. Typical lot size.
7. Polymer source used for product.
8. The primary resin used in manufacturing shall be identified as follows:
9. High Density Polyethylene (HDPE) resin type, class, grade and category in accordance with ASTM D1248 shall be identified. For example, Type III, Class A, Grade E5, Category 5.
10. Polypropylene (PP) resins, group, class and grade in accordance with ASTM D4101 shall be identified. For example, Group 1, Class 1, Grade 4.
11. Polyester (PET) resins minimum production intrinsic viscosity (ASTM D4603) and maximum carboxyl end groups (ASTM D7409) shall be identified
12. Protection

The UV resistance as measured by ASTM D4355 shall be the minimum value included in the Working Drawings.

1. Quality Control

Geosynthetic properties certifications with Minimum Average Roll Value (MARV), as defined in ASTM D4439, shall be provided from a laboratory accredited by the Geosynthetic Accreditation Institute-Laboratory Accreditation Program (GAI-LAP). For the testing geosynthetics, a “lot” shall be defined as a single day’s production. The table below shall be completed and included in the Working Drawings by the Wall Manufacturer.

| Test | | | Procedure | Testing Rate (Per SF Reinforcement) | Acceptable Result and Unit |
| --- | --- | --- | --- | --- | --- |
| Ultimate Tensile Strength | | or | ASTM D6637 | To be included in the Working Drawings by the Wall Manufacturer. | |
| Wide Width Tensile | | ASTM D4595 |
| Creep (Extrapolate to Design Life)1,2 | | | ASTM D5262/D6992 |
| Resistance to UV Degradation | | | ASTM D4355 |
| Hydrolysis Resistance (For PET Only) | | | ASTM D7409 |
| Intrinsic Viscosity | | | ASTM D4603 |
| Stress Cracking Resistance (For HDPE Only) | | | ASTM D1693 |
| 1 | ASTM D5262 Standard Test Method for Evaluating the Unconfined Tension Creep and Creep Rupture Behavior of Geosynthetics should have a minimum of 10,000 hours. | | | | |
| 2 | ASTM D6992 Standard Test Method for Accelerated Tensile Creep and Creep Rupture of Geosynthetic Materials Based on Time Temperature Superposition Using the Stepped Isothermal Method should have sufficient data to provide a prediction of behavior to a minimum of 106 hours | | | | |

1. Quality Assurance.

Quality Assurance testing of geosynthetic reinforcing elements will only be performed if deemed necessary by the Engineer.

925.03 Select Backfill for MSE Walls with Steel Reinforcing Elements

1. All pre-construction and production samples shall be tested by an AASHTO Materials Reference Laboratory (AMRL) accredited geotechnical laboratory. The laboratory utilized shall be certified for the given test being performed where offered by AMRL accreditation.
2. Select Backfill used in the MSE CSV (Common Structure Volume) shall be reasonably free from deleterious materials, shale or poor durability particles and shall conform to the following gradation limits as determined by AASHTO T 27:

| **Sieve Size** | **Percent Passing** |
| --- | --- |
| 4 inches | 100 |
| ¾ inch | 30-100 |
| No. 4 | 5-85 |
| No. 40 | 0-60 |
| No. 200 | 0‑15 |

The upper three feet of Select Backfill shall contain no stones greater than three inches in their greatest dimension, and shall not be composed primarily of gravel with less than 40 percent passing the ¾” sieve. No. 57 Coarse Aggregate in accordance with ASTM C33 shall be utilized in the CSV below the 100 year flood elevation.

1. Recycled Concrete Aggregate (RCA) and Reclaimed Asphalt Pavement (RAP) shall not be permitted to be included in Select Backfill material.
2. Only one Select Backfill material shall be used per wall. Select Backfill shall meet the following criteria:

| **Property** | | **Standard** | **Test Procedure** |
| --- | --- | --- | --- |
| Standard Proctor, lbs/ft3 | | Maximum Dry Density within ±15% of the Unit Weight Approved on the Working Drawings. | AASHTO T 99 |
| Organic Content, % | | < 1.00% of Total Sample Weight | AASHTO T 267 |
| Plasticity Index, PI % | | ≤ 6 | AASHTO T 90 |
| Resistivity, Ω – cm | | > 3,000  (at 100% saturation) | AASHTO T 288**1** |
| pH, dim. | | Acceptable Range of 5 – 10 | AASHTO T 289 |
| Chloride, ppm | | < 100 ppm | AASHTO T 291 or ASTM D 4327 |
| Sulfates, ppm | | < 200 ppm | AASHTO T 290 or ASTM D 4327 |
| Soundness (Magnesium Sulfate), % Loss | | < 30% after 4 Cycles | AASHTO T 104**2** |
| Soundness (Sodium Sulfate), % Loss | | < 15% after 5 Cycles | AASHTO T 104**2** |
| Internal Angle of Friction, φ, Degrees | | ≥ Value Specified (In Wall Manufacturer’s Working Drawings**3**) | AASHTO T 236**4** |
| 1 | ASTM G187 may be substituted for AASHTO T 288 in instances where insufficient material passing the No. 10 sieve is present. This test shall be completed on materials passing the number 4 sieve with an appropriately sized resistivity box utilized. Alternatively, the sample may be crushed to obtain sufficient material passing the No. 10 sieve and retained on the number 100 sieve such that AASHTO T 288 can be performed. | | |
| 2 | Soundness by AASHTO T 104 may be performed with either Magnesium Sulfate or Sodium Sulfate, both are not required. | | |
| 3 | Internal angle of friction specified in the wall manufacturer’s Working Drawings shall be between 34 and 38 degrees. | | |
| 4 | Conduct the test with the sample compacted to 95% of the maximum dry density and moister than of the optimum moisture content, obtained from the Standard Proctor (AASHTO T 99 Methods C or D with oversized correction factor as outlined in note 7 of AASHTO T99) on only the material passing the No. 10 sieve. Conduct the test at 0.5 tsf, 1.0 tsf, and 2.0 tsf confining pressures. Report the minimum friction angle obtained. | | |
|  |  | | |

1. Pre-Construction Testing Requirements:

The Contractor shall provide laboratory test results from an AMRL accredited laboratory in the following quantities from each source proposed documenting that Subsections 925.03 (B) through (D) of the “Select Backfill Material for MSE Walls with Steel Reinforcing Elements” section are satisfied for a representative sample of the proposed material, along with a certificate of compliance that the material satisfies this specification from each source to be used. The initial sample’s results shall be provided to the Engineer a minimum of 14 days prior to the start of construction on MSE Walls.

| **Parameter** | | **Test** | **Quantity of Tests Required** |
| --- | --- | --- | --- |
| Gradation | | AASHTO T 27 | 3 |
| Standard Proctor | | AASHTO T 99 |
| Organic Content | | AASHTO T 267 |
| Plasticity Index | | AASHTO T 90 |
| Resistivity | | AASHTO T 288 | If Resistivity > 10,000 Ω-cm at 100% Saturation, **1 Test**  If 5,000 ≤ Resistivity < 10,000 Ω-cm at 100% Saturation, **3 Tests**  If Resistivity < 5,000 Ω-cm at 100% Saturation, **5 Tests** |
| pH | | AASHTO T 289 | If Resistivity > 10,000 Ω-cm at 100% Saturation, **3 Tests**  If 5,000 ≤ Resistivity < 10,000 Ω-cm at 100% Saturation, **6 Tests**  If Resistivity < 5,000 Ω-cm at 100% Saturation, **10 Tests** |
| Chloride Content | | AASHTO T 291 or ASTM D 4327 |
| Sulfate Content | | AASHTO T 290 or ASTM D 4327 |
| Soundness | | AASHTO T 104 | 1 |
| Internal Angle of Friction**1** | | AASHTO T 236 | 1 |
| 1 | Where greater than 75% of the particles of the Select Backfill are retained on the ¾” sieve, the direct shear and tri-axial compression test requirements may be waived if a 34 degree internal angle of friction was used in the Wall Manufacturer’s design as documented on the Working Drawings. | | |
|  |  | | |

1. Production Testing Requirements:

The Contractor shall provide Quality Control (QC) laboratory test results at the following specified frequencies. The samples shall be taken from the source and the results shall be received prior to the material being delivered on site:

| **Parameter** | | **Test** | **Frequency** |
| --- | --- | --- | --- |
| Gradation | | AASHTO T 27 | Every **2,000 CY** with a  Minimum of 2 Tests per Structure |
| Standard Proctor | | AASHTO T 99 |
| Organic Content | | AASHTO T 267 |
| Plasticity Index | | AASHTO T 90 |
| Resistivity | | AASHTO T 288 | If Previous Test ≤ 5,000 Ω-cm at 100% Saturation,  Every **2,000 CY** with a Minimum of 2 Tests per Structure  or  If Previous Test > 5,000 Ω–cm at 100% Saturation,  Every **4,000 CY** with a Minimum of 2 Tests per Structure |
| pH**1, 2** | | AASHTO T 289 | If Previous Test ≤ 5,000 Ω-cm at 100% Saturation,  Every **1,000** CY with a Minimum of 2 Tests per Structure  or  If Previous Test > 5,000 Ω–cm at 100% Saturation,  Every **2,000 CY** with a Minimum of 2 Tests per Structure and  Chloride and Sulfate Content Tests may be Waived by the Engineer |
| Chloride Content**2** | | AASHTO T 291 or ASTM D 4327 |
| Sulfate Content**2** | | AASHTO T 290 or ASTM D 4327 |
| Soundness | | AASHTO T 104 | Every **4,000 CY** with a Minimum of 2 Tests per Structure |
| Internal Angle of Friction**3** | | AASHTO T 236 | Every **4,000 CY** with a Minimum of 2 Tests per Structure |
| 1 | A pH result outside the specified limits is cause for rejection of the material placed since the last pH test. | | |
| 2 | Backfill sources shall be rejected if resistivitymeasured for any one sample is less than 700 Ω-cm, chloride content > 500 ppm or sulfate content > 1000 ppm. | | |
| 3 | Where greater than 75% of the particles of the Select Backfill are retained on the ¾” sieve, the direct shear and tri-axial compression test requirements may be waived if a 34 degree internal angle of friction was used in the Wall Manufacturer’s design as documented on the Working Drawings. | | |

1. Failing results shall be addressed as follows:
2. Repeat failing QC tests at the Contractor’s expense on a resample.
3. Resampled tests shall be averaged with the failing sample test to determine the final tested soil properties.
4. If the average of the failing sample and the resampled test also fails, the material shall be removed at the Contractor’s expense up to the location where materials with passing test results were placed.
5. Quality Assurance Testing:

The Engineer will utilize a laboratory certified by AMRL. The selected laboratory utilized shall be certified for the given test to be performed where offered by AMRL accreditation, and other than the Contractor’s laboratory performing QC testing, to perform Quality Assurance (QA) testing on Select Backfill sampled from the source or on site at the following frequencies:

The Engineer will perform a full series of QA testing on every 4,000 CY including all tests in Subsections 925.03 (4) through (6) of the “Select Backfill Material for MSE Walls with Steel Reinforcing Elements” section, or additionally as deemed necessary by the Engineer based on a change in the appearance or behavior of the Select Backfill. The Engineer may waive some QA testing as follows:

1. Plasticity Index, if less than 30 percent passes the No. 40 sieve
2. Chloride Content, if QA resistivity test yields ≥ 5,000 Ω-cm
3. Sulfate Content, if QA resistivity test yields ≥ 5,000 Ω-cm
4. Soundness, if being quarried from a consistent source that is well documented to be capable of producing material with sufficient soundness.
5. Internal Friction Angle, if a friction angle of 34 degrees or less is specified in the Working Drawings and greater than 75% of the particles of the Select Backfill are retained on the 3/4" inch sieve.

925.04 Select Backfill for MSE Walls with Geosynthetic Reinforcing Elements

1. All pre-construction and production samples shall be tested by an AMRL accredited geotechnical laboratory. The laboratory utilized shall be certified for the given test to be performed where offered by AMRL accreditation.
2. Select Backfill shall be reasonably free from deleterious materials, shale or poor durability particles and shall conform to the following gradation limits as determined by AASHTO T 27:

| Sieve Size | Percent Passing |
| --- | --- |
| ¾ inch | 100 |
| No. 4 | 5-85 |
| No. 40 | 0-60 |
| No. 200 | 0‑10 |

No. 8 Coarse Aggregate in accordance with ASTM C33 shall be utilized in the Common Structure Volume below the 100 year flood plain.

1. Recycled Concrete Aggregate (RCA) and Reclaimed Asphalt Pavement (RAP) shall not be permitted to be included in Select Backfill material.
2. Select Backfill shall satisfy the following criteria:

|  |  |  |  |
| --- | --- | --- | --- |
| Property | | Standard | Test Procedure |
| Standard Proctor, lbs/ft3 | | Maximum Dry Density within ±15% of the Unit Weight Approved on the Working Drawings. | AASHTO T 99 |
| Organic Content, % | | < 1.00% of Portion Passing No. 10 Sieve | AASHTO T 267 |
| Plasticity Index, PI % | | ≤ 6 | AASHTO T 90 |
| pH | | 5 - 8 Permanent, 3 – 10 Temporary | AASHTO T 289 |
| Soundness (Magnesium Sulfate), % Loss | | < 30% after 4 Cycles | AASHTO T 104**1** |
| Soundness (Sodium Sulfate), % Loss | | < 15% after 5 Cycles | AASHTO T 104**1** |
| Internal Angle of Friction, φ, Degrees | | ≥ Value Specified (In Wall Manufacturer’s Working Drawings**2**) | AASHTO T 236**3** |
| 1 | Soundness by AASHTO T 104 may be performed with either Magnesium Sulfate or Sodium Sulfate, both are not required. | | |
| 2 | Internal angle of friction specified in the wall manufacturer’s working drawings shall be between 30 and 38 degrees. | | |
| 3 | Conduct the test with the sample compacted to 95% of the maximum dry density and moister than of the optimum moisture content, obtained from the Standard Proctor (AASHTO T 99 Methods C or D with oversized correction factor as outlined in note 7 of AASHTO T99) on only the material passing the No. 10 sieve. Conduct the test at 0.5 tsf, 1.0, tsf, and 2.0tsf confining pressures. Report the minimum friction angle obtained. | | |

1. Pre-Construction Sample Testing Requirements:

The Contractor shall provide laboratory test results from an AMRL accredited laboratory in the following quantities from each source proposed documenting that Subsections 925.04 (B) through (D) of the “Select Backfill for MSE Walls Reinforced with HDPE Geo-Grids” section are satisfied for a representative sample of the proposed material, along with a certificate of compliance that the material satisfies this specification. The initial sample’s results shall be provided to the Engineer a minimum of 14 days prior to the start of construction on MSE Walls.

| Parameter | Test | Number of Tests Required |
| --- | --- | --- |
| Gradation | AASHTO T 27 | 3 Tests |
| Standard Proctor | AASHTO T 99 |
| Organic Content | AASHTO T 267 |
| Plasticity Index | AASHTO T 90 |
| pH | AASHTO T 289 | **3 Tests** |
| Soundness | AASHTO T 104 | 1 Test |
| Internal Angle of Friction | AASHTO T 236 | 1 Test |

1. Production or Samples Testing Requirements:

The Contractor shall provide Quality Control (QC) laboratory test results at the following specified frequencies. The samples shall be taken from the source and the results shall be received prior to the material being delivered on site:

| Parameter | | Test | Frequency |
| --- | --- | --- | --- |
| Gradation | | AASTHO T 27 | Every **2,000 CY** with a  Minimum of 2 Tests per Structure |
| Standard Proctor | | AASHTO T 99 |
| Organic Content | | AASHTO T 267 |
| Plasticity Index | | AASHTO T 90 |
| pH**1** | | AASHTO T 289 |
| Soundness | | AASHTO T 104 | Every **4,000 CY** with a Minimum of 2 Tests per Structure |
| Internal Angle of Friction | | AASHTO T 236 | Every **4,000 CY** with a Minimum of 2 Tests per Structure |
| 1 | A pH result outside the specified limits is cause for rejection of the material placed since the last pH test. | | |

1. Failing results shall be addressed as follows:
2. Repeat failing QC tests at the Contractor’s expense on a resample.
3. Resampled tests shall be averaged with the failing sample test to determine the final tested soil properties.
4. If the average of the failing sample and the resampled test also fails the material shall be removed at the Contractor’s expense up to the location where materials with passing test results was placed, with the exception of Note One in the table above.
5. Quality Assurance Testing Recommendations:

The Engineer will utilize a third party independent AMRL certified laboratory, other than the Contractor’s laboratory performing QC testing, to perform Quality Assurance (QA) testing on Select Backfill sampled from the source or on site at the following frequencies:

The Engineer will perform a full series of QA testing on every 4,000 CY including all tests in Subsections 925.04 (4) through (6) of the “Select Backfill Material for MSE Walls with Geosynthetic Reinforcing Elements” section, or additionally as deemed necessary by the Engineer based on a change in the appearance or behavior of the Select Backfill. The Engineer may waive some QA testing as follows:

1. Plasticity Index, if less than 30 percent passes the No. 40 sieve
2. Soundness, if being quarried from a consistent source that is well documented to be capable of producing material with sufficient soundness.
3. Internal Friction Angle, if a friction angle of 34 degrees or less is specified in the Working Drawings

925.05 High Density Polyethylene (HDPE) Geomembrane Liner System

HDPE geo-membrane liner systems shall have a nominal thickness of 30 mils. The geomembrane shall be manufactured of new, first quality resin and shall be compounded and manufactured specifically for the intended purpose. The resin manufacturer shall certify each batch for the following properties:

| Property | Test Method | Requirements |
| --- | --- | --- |
| Specific Gravity | ASTM D792 | > 0.940 |
| Melt Index | ASTM D1238 | < 0.4g/10 min. |
| Carbon Black Content | ASTM D1603 | 2% - 3% |

The HDPE supplier shall submit this certification for the Engineer’s verification of the material.

The surface of the HDPE geo-membrane liner system shall not have striations, roughness, pinholes or bubbles and shall be free of holes, blisters and any foreign matter, such as soil or oil accumulation.

925.06 Class 2 Geotextile Fabric

Class 2 Geotextile Fabric shall be in accordance with AASHTO M 288 designed for filtration performance following the guidelines in FHWA NHI-07-092 (Holtz et al., 2008).

925.07 MSE Wall Systems

Refer to the QPL.

[Include the following with Contracts including Lighting and Luminaires, as necessary:]

Add the following Section:

[Include the following with Contracts including Intelligent Transportation Systems, as necessary:]

Section 927 – Intelligent Transportation System

Refer to the Intelligent Transportation System (ITS) Standard Drawings for application and usage of the product types found in this Section.

927.01 480-120/240, 37.5 KVA Transformer

Refer to the QPL.

927.02 120/240, 1-Phase Panelboard

Refer to the QPL.

927.03 SCC Disconnect 240V, 1-Phase, 100A, 2-Pole

Refer to the QPL.

927.04 SCC Panelboard 120/240 100A Main Lug

Refer to the QPL.

927.05 UPS Panelboard, 120V 70A Main Lug

Refer to the QPL.

927.06 Compression Ground Tap Connector

Refer to the QPL.

927.07 Thread Locker

Refer to the QPL.

927.08 Ground Terminal Kit

Refer to the QPL.

927.09 Type PS Junction Box, with Divider

Refer to the QPL.

927.10 Type PS Junction Box, Cover

Refer to the QPL.

927.11 ITSS Single 120/240

Refer to the QPL.

927.12 ITSS Double 120/240

Refer to the QPL.

927.13 ITSS 480V

Refer to the QPL.

Add the following Section:

[Include the following with Contracts including Bearings, as necessary:]

Section 928 – Bearings

928.01 High-Load Multi-Rotational Bearings

Refer to the QPL.

928.02 Laminated Elastomeric Bearings

Refer to the QPL.

928.03 Seismic Isolation Bearings

Refer to the QPL.

Add the following Section:

Section 929 – Trenchless Technology Materials

929.01 Casing Pipe

Casing pipe shall satisfy the following requirements:

1. Steel

Steel casing pipe shall be in accordance with ASTM A53 Grade B, ASTM A139 Grades B, C, D, or E, or ASTM A252 Grades 2 or 3. Sections of steel casing shall be welded or joined by an approved jointing system.

1. Reinforced Concrete Pipe (RCP)

Reinforced Concrete Pipe casing shall be in accordance with ASTM C76 Classes IV or V. All reinforced concrete pipes shall have steel reinforcement concentric with the pipe wall, and where required, additional reinforcement at the ends of the pipe.

1. High Density Polyethylene (HDPE)

High Density Polyethylene casing pipe shall be in accordance with ASTM D3350, with cell classifications of PE345444C, PE345454C, PE345464C, or in accordance with AWWA C906 PE4710.

1. Centrifugally Cast Fiberglass Reinforced Polymer Concrete (CCFRP)

Centrifugally Cast Fiberglass Reinforced Polymer Concrete casing pipe shall be in accordance with ASTM D3262 for non-pressure Sanitary Sewers, ASTM D3754 for Sewer Force Mains and Industrial Effluents, and AWWA C950 for Pressure Water Systems. The fiberglass material shall be in accordance with AWWA M45.

Table 1 - Casing Materials Accepted for Each Acceptable Method

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Material | Auger Boring | Pipe Jacking | Microtunneling | Horizontal Directional Drilling | Pipe Ramming |
| Centrifugally Cast Fiberglass Reinforced Polymer Concrete  CCFRP |  | X | X |  |  |
| High Density Polyethylene HDPE |  |  |  | X |  |
| Reinforced Concrete Pipe RCP |  | X | X |  |  |
| Steel | X | X | X | X | X |

Table 2 – Minimum Wall Thickness of Steel Casing

|  |  |
| --- | --- |
| Outside Diameter (in) | Minimum Wall Thickness (in) |
| ≤ 18 | 1/4 |
| 18 ≤ 20 | 5/16 |
| 20 ≤ 26 | 3/8 |
| 26 ≤ 42 | 1/2 |
| 42 ≤ 48 | 9/16 |

The table above provides minimum thicknesses allowed. The Contractor’s design shall dictate what wall thickness is required based on the site-specific conditions including but not limited to soil conditions, ground water conditions, equipment, reaction shaft, corrosion, and loads.

Table 3 – Minimum Corrosion Rates for Steel Casing (For Use in Contractor’s Design)

|  |  |
| --- | --- |
| Environmental Conditions | Sacrificial Steel Thickness (in/year) |
| Minimum Standard | 0.002 |
| Marine or Corrosive | 0.005 |

If corrosion protection other than sacrificial steel is considered, the Contractor shall consider the potential for abrasion.

If Utility Tunneling is used, steel or concrete liner plates, ribs with wood lagging, or wood box materials shall be in accordance with the approved SSWP.

**929.02 Carrier Pipe**

1. General

The Contractor shall select a carrier pipe material that is capable of withstanding the external loads, chemical attack, internal pressure, corrosion, and insulate current for a 100-year service life. In instances where the casing pipe is also acceptable as a carrier pipe, the casing pipe may serve as the carrier pipe.

**929.03 Filler Materials**

Materials shall conform to the following Sections and Subsections:

Portland Cement 905.01

Water 905.04

Concrete Admixtures, Curing Materials and Film Evaporators 906

1. Contact Grout
2. Contact Grout shall be early-strength non-shrink cementitious material suitable for contact grouting between casing pipe and earth.
3. The cement grout mix design shall be the responsibility of the Contractor.
4. Up to five percent bentonite may be included in the grout mix design.
5. Final proportions of materials shall be based on results of tests made on sample mixtures of grout, and included in the submittals of Section 533.
6. The minimum 28-day compressive strength of two-inch cubes, molded, cured, and tested in accordance with ASTM C109, shall be 2,500 psi.
7. The Contractor shall be responsible for taking, curing, and breaking of grout test cubes for determining mix design.
8. An independent laboratory approved by the Engineer may conduct Quality Assurance testing.
9. A minimum of one set of the grout cubes shall be taken for compressive strength testing each day of grouting.
10. The Contractor shall measure the specific gravity of grout with a Baroid mud balance or approved equal in every batch of grout mixed.
11. Controlled Low Strength Material (CLSM)
12. CLSM shall be a non-shrink cementitious material suitable for grouting the space between the casing pipe and the carrier pipe(s).
13. CLSM shall not be placed in contact with aluminum pipe, including connections, fixtures, etc., unless the aluminum has been coated with an approved primer.
14. The CLSM mix design shall be the responsibility of the Contractor.
15. The CLSM shall be a cement and water mixture. At the Contractors option, it may also contain aggregate with a maximum particle size of less than ¾” or chemical admixtures in any proportions such that the final product meets the strength and flow consistency requirements described herein.
16. All materials shall be mixed at a stationary mixing plant which is either a continuous or batch type plant, designed to accurately proportion either by volume or by weight, so that when the materials are incorporated in the mix, a thorough and uniform mix will result.
17. The mix may be transported in open haul units provided the material is placed within 30 minutes of the end of mixing. Use a rotating drum unit capable of 2-6 rpm to transport material which cannot be placed within 30 minutes after the end of mixing.
18. Perform ASTM D6130, Standard Test Method for Flow Consistency of Controlled Low Strength Material, a minimum of once each day grouting occurs.
19. During placement, a set of three cylinders shall be cast from each batch for compressive strength testing and shall obtain a 28-day compressive strengths between 40 psi and 150 psi.
20. The Contractor shall be responsible for taking, curing, and breaking of CLSM test cubes for determining mix design.
21. An independent laboratory approved by the Engineer may conduct Quality Assurance testing.
22. A minimum of one set of the CLSM cylinders shall be taken for compressive strength testing each day of grouting.
23. The Contractor shall measure the specific gravity of grout with a Baroid mud balance or approved equal in every batch of grout mixed.

Appendix A - Affirmative Action Mandatory Language

EXHIBIT B

MANDATORY EQUAL EMPLOYMENT OPPORTUNITY LANGUAGE

N.J.S.A. 10:5-31 et seq. (P.L. 1975, C. 127)

N.J.A.C. 17:27

CONSTRUCTION CONTRACTS

During the performance of this Contract, the Contractor agrees as follows:

The Contractor or Subcontractor, where applicable, will not discriminate against any employee or applicant for employment because of age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex. Except with respect to affectional or sexual orientation and gender identity or expression, the Contractor shall ensure that equal employment opportunity is afforded to such applicants in recruitment and employment, and that employees are treated during employment, without regard to their age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex. Such equal employment opportunity 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 Public Agency Compliance Officer setting forth provisions of this nondiscrimination clause.

The Contractor or Subcontractor, where applicable 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 age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex.

The Contractor or Subcontractor shall send to each labor union, with which it has a collective bargaining agreement, a notice, to be provided by the agency Contracting officer, advising the labor union or workers' representative of the Contractor's commitments under this act and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

The Contractor or Subcontractor, where applicable, agrees to comply with any regulations promulgated by the Treasurer, pursuant to N.J.S.A. 10:5-31 et seq., as amended and supplemented from time to time and the Americans with Disabilities Act.

When hiring or scheduling workers in each construction trade, the Contractor or Subcontractor agrees to make good faith efforts to employ minority and women workers in each construction trade consistent with the targeted employment goal prescribed by N.J.A.C. l7:27-7.2; provided, however, that the Dept. of LWD, Construction EEO Monitoring Program, may, in its discretion, exempt a Contractor or Subcontractor from compliance with the good faith procedures prescribed by the following provisions, A, B, and C, as long as the Dept. of LWD, Construction EEO Monitoring Program is satisfied that the Contractor or Subcontractor is employing workers provided by a union which provides evidence, in accordance with standards prescribed by the Dept. of LWD, Construction EEO Monitoring Program, that its percentage of active “card carrying” members who are minority and women workers is equal to or greater than the targeted employment goal established in accordance with N.J.A.C. 17:27-7.2. The Contractor or Subcontractor agrees that a good faith effort shall include compliance with the following procedures:

(A) If the Contractor or Subcontractor has a referral agreement or arrangement with a union for a construction trade, the Contractor or Subcontractor shall, within three business days of the Contract award, seek assurances from the union that it will cooperate with the Contractor or Subcontractor as it fulfills its affirmative action obligations under this Contract and in accordance with the rules promulgated by the Treasurer pursuant to N.J.S.A. 10:5-31 et seq., as supplemented and amended from time to time and the Americans with Disabilities Act. If the Contractor or Subcontractor is unable to obtain said assurances from the construction trade union at least five business days prior to the commencement of construction work, the Contractor or Subcontractor agrees to afford equal employment opportunities minority and women workers directly, consistent with this chapter. If the Contractor's or Subcontractor's prior experience with a construction trade union, regardless of whether the union has provided said assurances, indicates a significant possibility that the trade union will not refer sufficient minority and women workers consistent with affording equal employment opportunities as specified in this chapter, the Contractor or Subcontractor agrees to be prepared to provide such opportunities to minority and women workers directly, consistent with this chapter, by complying with the hiring or scheduling procedures prescribed under (B) below; and the Contractor or Subcontractor further agrees to take said action immediately if it determines that the union is not referring minority and women workers consistent with the equal employment opportunity goals set forth in this chapter.

(B) If good faith efforts to meet targeted employment goals have not or cannot be met for each construction trade by adhering to the procedures of (A) above, or if the Contractor does not have a referral agreement or arrangement with a union for a construction trade, the Contractor or Subcontractor agrees to take the following actions:

(l) To notify the public agency compliance officer, the Dept. of LWD, Construction EEO Monitoring Program, and minority and women referral organizations listed by the Division pursuant to N.J.A.C. 17:27-5.3, of its workforce needs, and request referral of minority and women workers;

(2) To notify any minority and women workers who have been listed with it as awaiting available vacancies;

(3) Prior to commencement of work, to request that the local construction trade union refer minority and women workers to fill job openings, provided the Contractor or Subcontractor has a referral agreement or arrangement with a union for the construction trade;

(4) To leave standing requests for additional referral to minority and women workers with the local construction trade union, provided the Contractor or Subcontractor has a referral agreement or arrangement with a union for the construction trade, the State Training and Employment Service and other approved referral sources in the area;

(5) If it is necessary to lay off some of the workers in a given trade on the construction site, layoffs shall be conducted in compliance with the equal employment opportunity and nondiscrimination standards set forth in this regulation, as well as with applicable Federal and State court decisions;

(6) To adhere to the following procedure when minority and women workers apply or are referred to the Contractor or Subcontractor:

(i) The Contractor or Subcontractor shall interview the referred minority or women worker.

(ii) If said individuals have never previously received any document or certification signifying a level of qualification lower than that required in order to perform the work of the construction trade, the Contractor or Subcontractor shall in good faith determine the qualifications of such individuals. The Contractor or Subcontractor shall hire or schedule those individuals who satisfy appropriate qualification standards in conformity with the equal employment opportunity and non-discrimination principles set forth in this chapter. However, a Contractor or Subcontractor shall determine that the individual at least possesses the requisite skills, and experience recognized by a union, apprentice program or a referral agency, provided the referral agency is acceptable to the Dept. of LWD, Construction EEO Monitoring Program. If necessary, the Contractor or Subcontractor shall hire or schedule minority and women workers who qualify as trainees pursuant to these rules. All of the requirements, however, are limited by the provisions of (C) below.

(iii) The name of any interested women or minority individual shall be maintained on a waiting list, and shall be considered for employment as described in (i) above, whenever vacancies occur. At the request of the Dept. of LWD, Construction EEO Monitoring Program, the Contractor or Subcontractor shall provide evidence of its good faith efforts to employ women and minorities from the list to fill vacancies.

(iv) If, for any reason, said Contractor or Subcontractor determines that a minority individual or a woman is not qualified or if the individual qualifies as an advanced trainee or apprentice, the Contractor or Subcontractor shall inform the individual in writing of the reasons for the determination, maintain a copy of the determination in its files, and send a copy to the public agency compliance officer and to the Dept. of LWD, Construction EEO Monitoring Program.

(7) To keep a complete and accurate record of all requests made for the referral of workers in any trade covered by the Contract, on forms made available by the Dept. of LWD, Construction EEO Monitoring Program and submitted promptly to the Dept. of LWD, Construction EEO Monitoring Program upon request.

(C) The Contractor or Subcontractor agrees that nothing contained in (B) above shall preclude the Contractor or Subcontractor from complying with the union hiring hall or apprenticeship policies in any applicable collective bargaining agreement or union hiring hall arrangement, and, where required by custom or agreement, it shall send journeymen and trainees to the union for referral, or to the apprenticeship program for admission, pursuant to such agreement or arrangement. However, where the practices of a union or apprenticeship program will result in the exclusion of minorities and women or the failure to refer minorities and women consistent with the targeted county employment goal, the Contractor or Subcontractor shall consider for employment persons referred pursuant to (B) above without regard to such agreement or arrangement; provided further, however, that the Contractor or Subcontractor shall not be required to employ women and minority advanced trainees and trainees in numbers which result in the employment of advanced trainees and trainees as a percentage of the total workforce for the construction trade, which percentage significantly exceeds the apprentice to journey worker ratio specified in the applicable collective bargaining agreement, or in the absence of a collective bargaining agreement, exceeds the ratio established by practice in the area for said construction trade. Also, the Contractor or Subcontractor agrees that, in implementing the procedures of (B) above, it shall, where applicable, employ minority and women workers residing within the geographical jurisdiction of the union.

After notification of award, but prior to signing a construction Contract, the Contractor shall submit to the public agency compliance officer and the Dept. of LWD, Construction EEO Monitoring Program an initial Project Workforce Report (Form AA-201) electronically provided to the public agency by the Dept. of LWD, Construction EEO Monitoring Program, through its website, for distribution to and completion by the Contractor, in accordance with N.J.A.C. 17:27-7. The Contractor also agrees to submit a copy of the Monthly Project Workforce Report once a month thereafter for the duration of this Contract to the Dept. of LWD, Construction EEO Monitoring Program, and to the public agency compliance officer.

The Contractor agrees to cooperate with the public agency in the payment of budgeted funds, as is necessary, for on-the-job and/or off-the-job programs for outreach and training of minorities and women.

(D) The Contractor and its Subcontractors shall furnish such reports or other documents to the Dept. of LWD, Construction EEO Monitoring Program as may be requested by the Dept. of LWD, Construction EEO Monitoring Program from time to time in order to carry out the purposes of these regulations, and public agencies shall furnish such information as may be requested by the Dept. of LWD, Construction EEO Monitoring Program for conducting a compliance investigation pursuant to N.J.A.C. 17:27-1.1 et seq.

**Additional Mandatory Construction Contract Language For State Agencies, Independent Authorities, Colleges and Universities Only**

Executive Order 151 (Corzine, August 28, 2009) and P.L.2009, c.335 include a provision which require all state agencies, independent authorities and colleges and universities to include additional mandatory equal employment and affirmative action language in its construction Contracts. It is important to note that this language is in addition to and does not replace the mandatory Contract language and good faith efforts requirements for construction Contracts required by N.J.A.C. 17:27-3.6, 3.7 and 3.8, also known as Exhibit B. The additional mandatory equal employment and affirmative action language is as follows:

It is the policy of the New Jersey Turnpike Authority that its Contracts should create a workforce that reflects the diversity of the State of New Jersey. Therefore, Contractors engaged by the New Jersey Turnpike Authority to perform under a construction Contract shall put forth a good faith effort to engage in recruitment and employment practices that further the goal of fostering equal opportunities to minorities and women.

The Contractor must demonstrate to the New Jersey Turnpike Authority’s satisfaction that a good faith effort was made to ensure that minorities and women have been afforded equal opportunity to gain employment under the New Jersey Turnpike Authority’s Contract with the Contractor. Payment may be withheld from a Contractor’s Contract for failure to comply with these provisions.

Evidence of a “good faith effort” includes, but is not limited to:

1. The Contractor shall recruit prospective employees through the State Job bank website, managed by the Department of Labor and Workforce Development, available online at <https://careerconnections.nj.gov/>

2. The Contractor shall keep specific records of its efforts, including records of all individuals interviewed and hired, including the specific numbers of minorities and women;

3. The Contractor shall actively solicit and shall provide the New Jersey Turnpike Authority with proof of solicitations for employment, including but not limited to advertisements in general circulation media, professional service publications and electronic media;

4. The Contractor shall provide evidence of efforts described at 2 above to the New Jersey Turnpike Authority no less frequently than once every 12 months; and

5. The Contractor shall comply with the requirements set forth at N.J.A.C. 17:27- 1.1 et seq.

To ensure successful implementation of the Executive Order and Law, state agencies, independent authorities and colleges and universities must forward an Initial Project Workforce Report (AA-201) for any projects funded with ARRA money to the Dept. of LWD, Construction EEO Monitoring Program immediately upon notification of award but prior to execution of the Contract.

Appendix H - Georgia Department of Transportation Test No. 78

1. Scope

Use this test method to determine the Profile Index from profilograms of deck slabs and approach slabs, made with the profilograph.

Determining the Profile Index involves measuring “scallops” that appear outside a blanking band.

1. Apparatus

The apparatus consists of only the following:

Scale: Use a clear plastic scale, 1.50 inch wide and 11.0 inch long. Near the center of the scale is an opaque band, 0.1 inch wide, extending the entire length of 11.0 inches. On either side of this band are lines scribed 0.1 inch apart, parallel to the opaque band. These lines serve as a convenient scale to measure deviations, or scallops of the graph above or below the blanking band.

1. Sample Size and Preparation

No special sample preparation is needed.

1. Procedures

Place the plastic scale over the profile so it blanks out as much of the profile as possible. The scallops above and below the blanking band will be approximately balanced (See [Figure 1](http://tomcat2.dot.state.ga.us/thesource/pdf/auxdata/gdt/gdt078.html#Figure781#Figure781)).

The profile trace will move from a generally horizontal position when going around super-elevated curves, making it impossible to blank out the central portion of the trace without shifting the scale.

In this case, break the profile into short sections and reposition the blanking band on each section (see [Figure 2](http://tomcat2.dot.state.ga.us/thesource/pdf/auxdata/gdt/gdt078.html#Figure782#Figure782).).

Beginning at the right end of the scale, measure and total the height of all the scallops appearing both above and below the blanking band.

Measure each scallop to the nearest 0.05 inch.

Short portions of the profile line may be visible outside the blanking band, but unless they project 0.03 inch or more and extend longitudinally for 2 feet or more, do not include them in the count. (See [Figure 1](http://tomcat2.dot.state.ga.us/thesource/pdf/auxdata/gdt/gdt078.html#Figure781#Figure781) for special conditions.)

After totaling the scallops in the first scale length, slide the scale to the left. Align the right end of the scale with a small mark made at the end of the first scale length.

1. Calculations

The Profile Index is determined as “inches per mile in excess of the 0.1 inch blanking band.” The formula for calculating Profile Index is:



1. Report

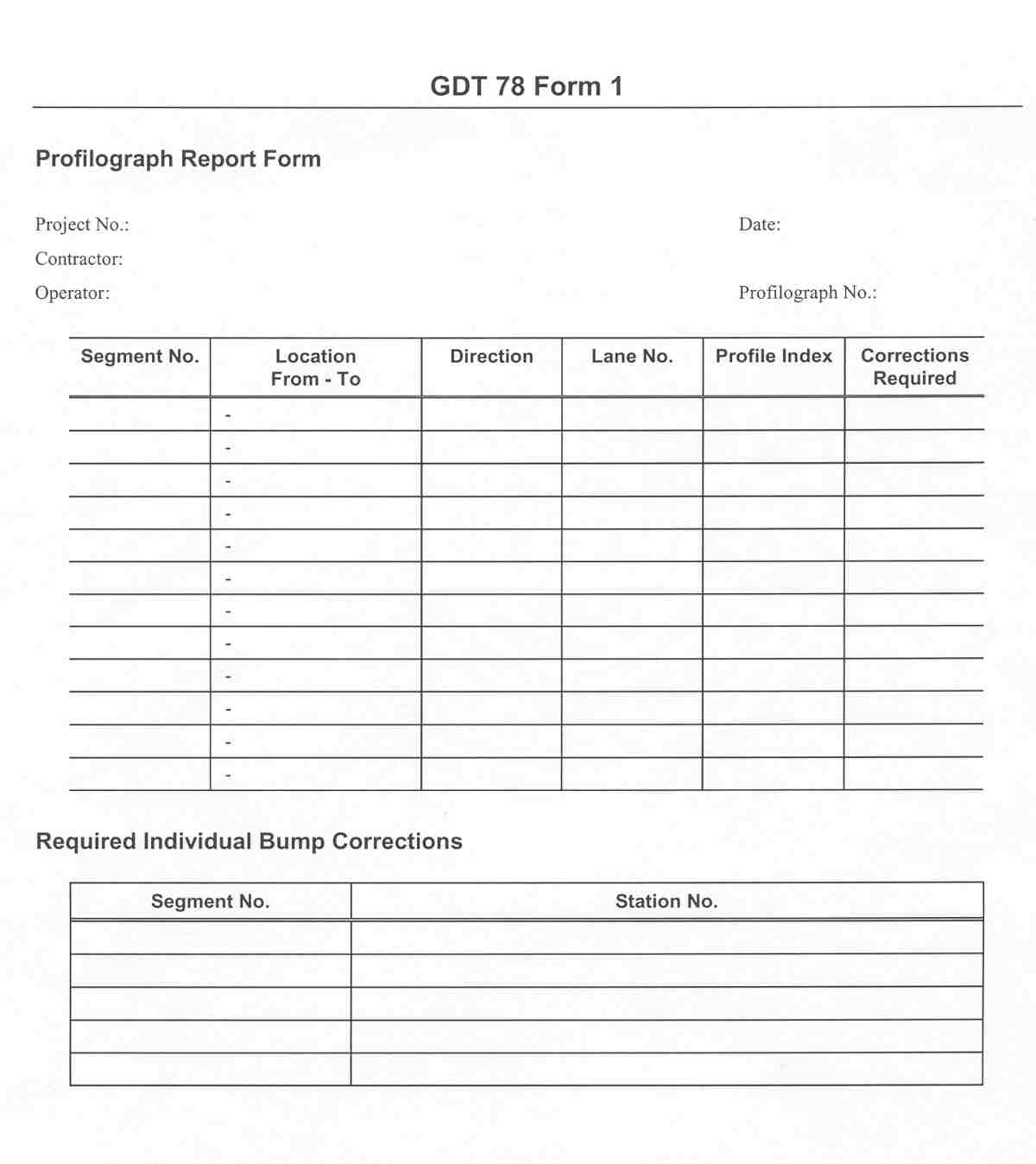
Report the profile index in “inches per mile in excess of the 0.1 inch blanking band” on the [Profilograph Report Form](http://tomcat2.dot.state.ga.us/thesource/pdf/auxdata/gdt/gdt078.html#ProfilographForm#ProfilographForm).



Figure 1



Figure 2



Profilograph Form

Appendix I - NJPDES Stormwater Permit Program

**Attachment E – Best Management Practices for**

**Maintenance Yards and Other Ancillary Operations**

***(NJDEP Highway Agency Stormwater General Permit)***

The permittee shall implement the following practices at maintenance yards and other ancillary operations owned or operated by the permittee. Inventory of Materials and Machinery, and Inspections and Good Housekeeping shall be conducted at all maintenance yards and other ancillary operations. All other Best Management Practices shall be conducted whenever activities described below occur. Ancillary operations include but are not limited to impound yards, permanent and mobile fueling locations, and yard trimmings and wood waste management sites.

|  |
| --- |
| **Inventory of Materials and Machinery** |
| The SPPP shall include separate forms listing the physical address, materials, machinery, and activities of each maintenance yard and ancillary operation where they could be a source of pollutants in a stormwater discharge. The materials in question include but are not limited to: raw materials; intermediate products; final products; waste materials; by-products; machinery and fuels; and lubricants, solvents, and detergents that are related to the maintenance yard operations and ancillary operations. Materials or machinery that are not exposed to stormwater at the maintenance yard or related to its operations do not need to be included. |

|  |
| --- |
| **Inspections and Good Housekeeping** |
| 1. Inspect the entire site, including the site periphery, monthly (under both dry and wet conditions, when possible). Identify conditions that would contribute to stormwater contamination, illicit discharges or negative impacts to the permittee’s MS4. Maintain an inspection log detailing conditions requiring attention and remedial actions taken for all activities occurring at Maintenance Yards and Other Ancillary Operations. This log must contain, at a minimum, a record of inspections of all operations listed in Part IV.B.5.c. of this permit including dates and times of the inspections, and the name of the person conducting the inspection and relevant findings. This log must be kept on-site, and its location referenced in the SPPP and made available to the Department upon request. See the Highway Agency Guidance document at <https://www.nj.gov/dep/dwq/highway_guidance.htm> for additional information. 2. Conduct cleanups of spills of liquids or dry materials immediately after discovery. All spills shall be cleaned using dry cleaning methods only. Clean up spills with a dry, absorbent material (i.e., kitty litter, sawdust, etc.) and sweep the rest of the area. Dispose of collected waste properly. Store clean-up materials, spill kits and drip pans near all liquid transfer areas, protected from rainfall. 3. Properly label all containers. Labels shall be legible, clean and visible. Keep containers in good condition, protected from damage and spillage, and tightly closed when not in use. When practical, store containers indoors. If indoor storage is not practical, containers may be stored outside if covered and placed on spill platforms or clean pallets. An area that is graded and/or contained by berms to prevent run-through of stormwater may be used in place of spill platforms or clean pallets. Outdoor storage locations shall be regularly maintained. |

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| **Fueling Operations** |
| 1. Establish, maintain and implement standard operating procedures to address vehicle fueling; receipt of bulk fuel deliveries; and inspection and maintenance of storage tanks, including the associated piping and fuel pumps.    1. Place drip pans under all hose and pipe connections and other leak-prone areas during bulk transfer of fuels.    2. Block storm sewer inlets, or contain tank trucks used for bulk transfer, with temporary berms or temporary absorbent booms during the transfer process. If temporary berms or booms are being used instead of blocking the storm sewer inlets, all hose connection points associated with the transfer of fuel shall be within the temporarily contained by berms or boomed area during the loading/unloading of bulk fuels. A trained employee shall be present to supervise the bulk transfer of fuel.    3. Clearly post, in a prominent area of the facility, instructions for safe operation of fueling equipment. Include the following:       * “Topping off vehicles, mobile fuel tanks, and storage tanks is strictly prohibited”       * “Stay in view of fueling nozzle during dispensing”       * Contact information for the person(s) responsible for spill response.    4. Immediately repair or replace any equipment, tanks, pumps, piping and fuel dispensing equipment found to be leaking or in disrepair. |

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| **Discharge of Stormwater from Secondary Containment** |
| The discharge pipe/outfall from a secondary containment area (e.g., fuel storage, de-icing solution storage, brine solution) shall have a valve and the valve shall remain closed except as described below. The permittee may discharge stormwater accumulated in a secondary containment area if a visual inspection is performed to ensure that the contents of aboveground storage tank have not been in contact with the stormwater to be discharged. Visual inspections are only effective when dealing with materials that can be observed, like petroleum. If the contents of the tank are not visible in stormwater, the permittee shall rely on previous tank inspections to determine with some degree of certainty that the tank has not leaked. If the permittee cannot determine with reasonable certainty that the stormwater in the secondary containment area is uncontaminated by the contents of the tank, then the stormwater shall be hauled for proper disposal. |

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| **Vehicle Maintenance** |
| 1. Operate and maintain equipment to prevent the exposure of pollutants to stormwater. 2. Whenever possible, conduct vehicle and equipment maintenance activities indoors. Floor drain discharge locations shall be identified in the SPPP.   3. For projects that must be conducted outdoors, and that last more than one day, portable tents or covers shall be placed over the equipment being serviced when not being worked on, and drip pans shall be used. Use designated areas away from storm drains or block storm drain inlets when vehicle and equipment maintenance is being conducted outdoors. |

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| **On-Site Equipment and Vehicle Washing and Wash Wastewater Containment** |
| 1. Manage any equipment and vehicle washing activities so that there are no unpermitted discharges of wash wastewater to storm sewer inlets or to surface or ground waters of the State. 2. Permittee’s which cannot discharge wash wastewater to a sanitary sewer or which cannot otherwise comply with 1, above, may temporarily contain wash wastewater prior to proper disposal under the following conditions: 3. Containment structures shall not leak. Any underground tanks and associated piping shall be tested for integrity every 3 years using appropriate methods determined by “*The List of Leak Detection Evaluations for Storage Tank Systems”* created by the National Work Group on Leak Detection Evaluations (NWGLDE) or as determined appropriate and certified by a professional engineer for the site-specific containment structure(s)**.** 4. For any containment system protected by cathode, provide a passing cathodic protection survey every three years. 5. Operate containment structures to prevent overfilling resulting from normal or abnormal operations, overfilling, malfunctions of equipment, and human error. Overfill prevention shall include manual sticking/gauging of the tank before each use unless system design prevents such measurement. Tank shall no longer accept wash wastewater when determined to be at 95% capacity. Record each measurement to the nearest ½ inch. 6. Before each use, perform inspections of all visible portions of containment structures to ensure that they are structurally sound, and to detect deterioration of the wash pad, catch basin, sump, tank, piping, risers, walls, floors, joints, seams, pumps and pipe connections or other containment devices. The wash pad, catch basin, sump and associated drains shall be kept free of debris before each use. Log dates of inspection; inspector's name, and conditions. This inspection is not required if system design prevents such inspection. 7. Containment structures shall be emptied and taken out of service immediately upon detection of a leak. Complete all necessary repairs to ensure structural integrity prior to placing the containment structure back into service. Any spills or suspected release of hazardous substances shall be immediately reported to the NJDEP Hotline (1-877-927-6337) followed by a site investigation in accordance with N.J.A.C. 7:26C and N.J.A.C 7:26E if the discharge is confirmed. 8. All equipment and vehicle wash wastewater placed into storage must be disposed of in a legally permitted manner (e.g., pumped out and delivered to a duly permitted and/or approved wastewater treatment facility). 9. Maintain a log of equipment and vehicle wash wastewater containment structure clean-outs including date and method of removal, mode of transportation (including name of hauler if applicable) and the location of disposal. See Underground Vehicle Wash Water Storage Tank Use Log at end of this attachment. 10. Containment structures shall be inspected annually by a NJ licensed professional engineer. The engineer will certify the condition of all structures including: wash pad, catch basin, sump, tank, piping, risers to detect deterioration in the walls, floors, joints, seams, pumps and pipe connections or other containment devices using the attached Engineer’s Certification of Annual Inspection of Equipment and Vehicle Wash Wastewater Containment Structure. This certification may be waived for self-contained systems on a case-by-case basis. Any such waiver would be issued in writing by the Department. 11. Maintain all logs, inspection records, and certifications on-site. Such records shall be made available to the Department upon request. |

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| **Salt and De-icing Material Storage and Handling** |
| 1. Store material in a permanent structure. 2. Perform regular inspections and maintenance of storage structure and surrounding area. 3. Minimize tracking of material from loading and unloading operations. 4. During loading and unloading:    1. Conduct during dry weather, if possible;    2. Prevent and/or minimize spillage; and    3. Minimize loader travel distance between storage area and spreading vehicle. 5. Sweep (or clean using other dry-cleaning methods):    1. Storage areas on a regular basis;    2. Material tracked away from storage areas;    3. Immediately after loading and unloading is complete. 6. Reuse or properly discard materials collected during cleanup. 7. Temporary outdoor storage is permitted only under the following conditions:    1. A permanent structure is under construction, repair or replacement;    2. Stormwater run-on and de-icing material run-off is minimized;    3. Materials in temporary storage are tarped when not in use;    4. The requirements of 2 through 6, above are met; and    5. Temporary outdoor storage shall not exceed 30 days unless otherwise approved in writing by the Department; 8. Sand must be stored in accordance with Aggregate Material and Construction Debris Storage below. |

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| **Aggregate Material and Construction Debris Storage** |
| 1. Store materials such as sand, gravel, stone, top soil, road millings, waste concrete, asphalt, brick, block and asphalt-based roofing scrap and processed aggregate in such a manner as to minimize stormwater run-on and aggregate run-off via surface grading, dikes and/or berms (which may include sand bags, hay bales and curbing, among others) or three-sided storage bays. The area in front of storage bays and adjacent to storage areas shall be swept clean after loading/unloading. 2. Sand, top soil, road millings and processed aggregate may only be stored outside and uncovered if in compliance with item 1 above and a 50-foot setback is maintained from surface water bodies, storm sewer inlets, and/or ditches or other stormwater conveyance channels. 3. Road millings must be managed in conformance with the “Recycled Asphalt Pavement and Asphalt Millings (RAP) Reuse Guidance” (see <https://dep.nj.gov>) or properly disposed of as solid waste pursuant to N.J.A.C. 7:26-1 et seq. 4. Cold patch shall be stored in a permanent structure or on an impervious surface and covered with a waterproof material (i.e., tarpaulin or 10-mil plastic sheeting) that is contained (e.g., contained by berms) to control leachate and stormwater run-on or run through. 5. The stockpiling of materials and construction of storage bays on certain land (including but not limited to coastal areas, wetlands and floodplains) may be subject to regulation by the Division of Land Use Regulation (see [www.nj.gov/dep/landuse/](http://www.nj.gov/dep/landuse/) for more information). |

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| **Street Sweepings, Catch Basin Clean Out, and Other Material Storage** |
| 1. For the purposes of this permit, this BMP is intended for road cleanup materials as well as other similar materials. Road cleanup materials may include but are not limited to street sweepings, storm sewer clean out materials, stormwater basin clean out materials and other similar materials that may be collected during road cleanup operations. These BMPs do not include materials such as liquids, wastes which are removed from sanitary sewer systems or material which constitutes hazardous waste in accordance with N.J.A.C. 7:26G-1.1 et seq. 2. Road cleanup materials must be ultimately disposed of in accordance with N.J.A.C. 7:26-1.1 et seq. See the “Guidance Document for the Management of Street Sweepings and Other Road Cleanup Materials” (see <https://dep.nj.gov>). 3. Road cleanup materials placed into temporary storage must be, at a minimum:    1. Stored in leak-proof containers or on an impervious surface and covered with a waterproof material (i.e., tarpaulin or 10-mil plastic sheeting) that is contained (e.g., contained by berms) to control leachate and stormwater run-on or run through; and    2. Removed for disposal (in accordance with 2, above) within six (6) months of placement into storage. |

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| **Yard Trimmings and Wood Waste Management Sites** |
| 1. These practices are applicable to any yard trimmings or wood waste management site:    1. Owned and operated by the permittee;       1. For staging, storing, composting or otherwise managing yard trimmings, or       2. For staging, storing or otherwise managing wood waste, and    2. Operated in compliance with the Recycling Rules found at N.J.A.C. 7:26A. 2. Yard trimmings or wood waste management sites must be operated in a manner that:    1. Diverts stormwater away from yard trimmings and wood waste management operations;    2. Minimizes or eliminates the exposure of yard trimmings, wood waste and related materials to stormwater;    3. Eliminates the discharge of stormwater that contacts source material from yard trimmings or wood waste management sites to storm sewer inlets or surface waters of the State. 3. Yard trimmings and wood waste management site specific practices:    1. Construct windrows, staging and storage piles:       1. In such a manner that materials contained in the windrows, staging and storage piles (processed and unprocessed) do not enter waterways of the State;       2. On ground which is not susceptible to seasonal flooding;       3. In such a manner that prevents stormwater run-on and leachate run-off (e.g., use of covered areas, diversion swales, ditches or other designs to divert stormwater from contacting yard trimmings and wood waste).    2. Maintain perimeter controls such as curbs, berms, hay bales, silt fences, jersey barriers or setbacks, to eliminate the discharge of stormwater runoff carrying leachate or litter from the site to storm sewer inlets or to surface waters of the State.    3. Prevent on-site storm drain inlets from siltation using controls such as hay bales, silt fences, or filter fabric inlet protection.    4. Dry weather run-off that reaches a stormwater sewer system is an illicit discharge. Possible sources of dry weather run-off include wetting of piles by the site operator; uncontrolled pile leachate or uncontrolled leachate from other materials stored at the site.    5. Remove trash from yard trimmings and wood waste upon receipt.    6. Monitor site for trash on a routine basis.    7. Store trash in leak-proof containers or on an impervious surface that is contained (e.g., contained by berms) to control leachate and litter;    8. Dispose of collected trash at a permitted solid waste facility.    9. Employ preventative tracking measures, such as gravel, quarry blend, or rumble strips at exits. |

NEW JERSEY TURNPIKE AUTHORITY

STAGING AREA INVENTORY/ INSPECTION FORM

NEW JERSEY POLLUTANT DISCHARGE ELIMINATION SYSTEM

STORMWATER PERMIT PROGRAM

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| Date Submitted: |  | | |
| Contract Number: |  | | |
| Contractor Name: |  | | |
| Contractor’s Contact Information | Name: |  | |
| Phone: |  | |
| Mailing Address: |  | |
| E-mail: |  | |
| Staging Area Location: (Roadway & Milepost) |  | | |
| Status | Check one: | | 🞏 Occupying 🞏 Vacating |
| Estimated Dates of Occupancy: | | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

The purpose of this inspection form is to obtain information needed to comply with the New Jersey Department of Environmental Protection (NJDEP) regulations on stormwater management. Your responses will assist the New Jersey Turnpike Authority to determine what measures are needed to comply with its stormwater discharge permit requirements and minimize stormwater pollutants that may enter the waters of the State. Refer to Subsection 105.07 for additional instructions.

The completed Inspection Form shall be submitted to the Engineer per Subsection 105.07. VEHICLES AND EQUIPMENT

A general list of machinery that is exposed to stormwater and could potentially be a source of stormwater pollutants is needed. Review the list below and identify the types of machinery that are present on-site and are exposed to stormwater. Add any additional machinery not already shown on the list.

Attach additional sheets if necessary.

|  |  |  |  |
| --- | --- | --- | --- |
| VEHICLE AND EQUIPMENT INVENTORY | | | |
| Vehicle/Equipment | On-Site  (yes/no) | Storage Location  (indoors/outdoors) | Exposed to Stormwater  (yes/no) |
| Automobiles |  |  |  |
| Pick-up Trucks |  |  |  |
| Dump Trucks |  |  |  |
| Backhoes |  |  |  |
| Loaders |  |  |  |
| Bulldozers |  |  |  |
| Painting Equipment |  |  |  |
| Paving Equipment |  |  |  |
| Sweepers |  |  |  |
| Snow Plows |  |  |  |
| Tractors |  |  |  |
| Mowers |  |  |  |
| Generators |  |  |  |
| Equipment Trailers |  |  |  |
| Screeners |  |  |  |
| Wood Chippers |  |  |  |
| Compressors |  |  |  |
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1. Materials Inventory

A general list of materials that are exposed to stormwater and could potentially be a source of stormwater pollutants is needed. Review the list below and identify the types of materials that are stored on-site and are exposed to stormwater. Add any additional materials not already shown on the list.

Attach additional sheets if necessary.

|  |  |  |  |
| --- | --- | --- | --- |
| MATERIALS EXPOSED TO STORMWATER | | | |
| Material | Stored On-Site  (yes/no) | Container Type  (drum, tank, bucket, etc.) | Exposed to Stormwater  (yes/no) |
| Salt |  |  |  |
| Sand/gravel/soil |  |  |  |
| Street sweepings |  |  |  |
| Asphalt mix |  |  |  |
| Paint |  |  |  |
| Pesticides/Herbicides |  |  |  |
| Gasoline |  |  |  |
| Diesel Fuel |  |  |  |
| Heating oil |  |  |  |
| Kerosene |  |  |  |
| Hydraulic fluid |  |  |  |
| Antifreeze |  |  |  |
| Motor oil |  |  |  |
| Waste oil |  |  |  |
| Transmission fluid |  |  |  |
| Batteries |  |  |  |
| Degreasing fluid/parts cleaner |  |  |  |
| Detergent |  |  |  |
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1. FUELING OPERATIONS

The stormwater permit requires equipment and procedures to reduce the chance that a fuel spill will discharge into the surface water drainage system. Identify the fuel tanks at the staging area, and provide responses to the fuel system operations questions. If a question does not apply to your location, mark “N/A” in the response box.

Attach additional sheets if necessary.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| FUEL TANK INFORMATION | | | | |
| Tank No. | Tank Capacity (gallons) | Tank Contents  (gasoline, diesel, etc.) | Tank Type  (aboveground/  underground) | If Aboveground, Tank is Diked  (yes/no) |
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| FUEL DISPENSER INFORMATION | | | |
| Tank No. | Number of Dispensers | Dispenser Location  (on tank/on fuel island) | Distance to Nearest Storm Drain or Drainage Ditch |
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| FUEL SYSTEM OPERATIONS  Please explain any “NO” answers. Attach additional sheets if necessary. | |
| 1. Is the contact information for the person(s) responsible for spill response clearly posted in the fueling area? |  |
| 2. Are the fuel system equipment operation procedures clearly posted in the fueling area? |  |
| 3. Are drip pans used under all hose and pipe connections during bulk fuel transfers to/from the storage tanks? |  |
| 4. Is a trained employee always present to supervise bulk fuel transfers to/from the storage tanks? |  |
| 5. Is spill containment equipment (storm sewer inlet blocks, spill containment berms, absorbent booms, etc.) available for use during bulk fuel transfers to/from the tanks? |  |
| 5a. If so, is the spill containment equipment used during bulk fuel transfers? |  |
| 6. Are the fuel system operators instructed that “topping off” of vehicles, mobile fuel tanks, and storage tanks is not permitted? |  |
| 7. Is leaking, worn, or damaged fuel system equipment repaired or replaced immediately? |  |

1. VEHICLE AND EQUIPMENT MAINTENANCE

The Stormwater Permit encourages that all vehicle and equipment maintenance be performed indoors whenever possible. The following questions address existing maintenance procedures.

Please explain any “NO” answers. Attach additional sheets if necessary.

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| VEHICLE AND EQUIPMENT MAINTENANCE | |
| 1. Is any vehicle and equipment maintenance performed outdoors? |  |
| 1a. If yes, when vehicle and/or equipment maintenance lasting more than one day is performed outdoors, is the vehicle or equipment covered with a tarp or tent when not being worked on? |  |
| 1c. If yes, when vehicle and/or equipment maintenance is performed outdoors, are drip pans used beneath the vehicle or equipment? |  |

1. GENERAL GOOD HOUSEKEEPING PROCEDURES

The stormwater permit requires general good housekeeping practices for storage of materials in containers and cleanup of spilled materials. The following questions address both topics.

Please explain any “NO” answers. Attach additional sheets if necessary.

|  |  |
| --- | --- |
| CONTAINER STORAGE REQUIREMENTS | |
| 1. Are all containers and aboveground storage tanks maintained in good condition (not leaking, not rusting, etc.)? |  |
| 2. Are the contents of all containers and aboveground storage tanks identified with clean and visible labels? |  |
| 3. Are all containers and aboveground storage tanks tightly closed when not in use? |  |
| 4. Are outdoor container storage areas covered to prevent precipitation from falling onto the containers? |  |
| 5. Are containers stored in outdoor areas located on raised pads, spill pallets, or in bermed/diked areas? |  |
| 6. Are any berms/dikes in good condition and capable of containing a spill? |  |
| 7. Are container storage areas maintained regularly? |  |

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| SPILL CLEANUP PROCEDURES | |
| 1. Is absorbent material (Speedy-Dry, sawdust, kitty litter, etc.) available for cleaning up spills? |  |
| 2. Are all spills of liquid or dry materials cleaned up immediately after discovery? |  |
| 3. Are spills ever cleaned up by washing or rinsing?  3a. If yes, please explain. |  |
| 4. Are all spilled material and used absorbent swept up and disposed of properly? |  |
| 5. Are spill cleanup materials, spill kits, and drip pans kept in all liquid transfer areas (near storage tanks, container storage areas, etc.)? |  |
| 6. Are all spill materials and spill kits stored in dry areas protected from rainfall? |  |

1. DE-ICING MATERIAL HANDLING PROCEDURES

The stormwater permit requires specific procedures for handling road de-icing salt.

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| SALT STORAGE/HANDLING PROCEDURES | |
| 1. Is salt stored at the facility? |  |
| 2. Is all salt stored inside salt domes or other permanent, covered storage buildings? |  |
| 3. Is spilled salt swept up and re-used or discarded after completion of loading/unloading activities? |  |
| 4. Are salt handling areas swept on a regular basis? |  |
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1. FACILITY DRAINAGE

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| DRAINAGE FROM PARKING/STORAGE AREAS | |
| 1. Do the outdoor areas of the facility have storm drain inlets? |  |
| 1a. If yes, do the storm drains discharge to the sanitary sewer system? |  |
| 1b. If yes, do the storm drains discharge through an oil/water separator? |  |
| 1c. If yes, are any storm drain inlets located in unpaved areas? |  |
| 1d. If yes, are the storm drain inlets labeled to alert employees that they discharge to surface water? |  |

1. VEHICLE AND EQUIPMENT WASHING PROCEDURES

The stormwater permit does not regulate vehicle and equipment washing activities. However, responses to the following questions will help to determine the types of water discharges at the storage/staging area.

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| VEHICLE AND EQUIPMENT WASHING | |
| 1. Does the facility have a washbay or other vehicle/equipment washing facility? |  |
| 2. Do the washbay drains discharge to the sanitary sewer or to the storm sewer? |  |
| 3. Do the washbay drains discharge through an oil/water separator? |  |
| 4. Are vehicles/equipment rinsed in outdoor areas near storm drain inlets or stormwater drainage ditches/swales? |  |
| 5. Is all loose debris (sand, salt, grass clippings, etc.) brushed off of the vehicles/equipment and disposed of before rinsing? |  |
| 6. Does the vehicle/equipment rinsing include the use of soap, degreasers, or other cleaning compounds? |  |
| 7. Do the rinsing operations include cleaning engines? |  |

1. STOCKPILED MATERIALS

The stormwater permit sets limits on the stockpiling of sand, soil, street sweepings, and similar materials. The following questions deal with open stockpiles at the maintenance facility/staging area.

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| STOCKPILED MATERIALS | |
| 1. Are there stockpiles of sand, soil, gravel, or street sweepings at the staging area? |  |
| 2. Are the stockpiles within 50 feet of a storm drain inlet, drainage ditch, swale, stream, or other drainage facility? |  |
| 3. Are the stockpiles enclosed in bins? |  |
| 4. Do the bins allow the stockpiled material to spill out through gaps or openings in the bin walls? |  |

1. SWEEPING

The stormwater permit requires that facilities are swept at least once every three months.

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| SWEEPING | |
| 1. Are paved areas of the facility swept regularly using a mechanical sweeper? |  |
| 2. What is the approximate frequency of sweeping? |  |

1. REFUSE CONTAINERS AND DUMPSTERS

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| REFUSE CONTAINERS AND DUMPSTERS | |
| 1. Are there any dumpsters or refuse containers located outdoors and exposed to stormwater (not including temporary demolition containers, litter receptacles, and containers for large bulky items)? |  |
| 1A. If yes: Are these containers covered at all times to prevent spilling, dumping or leaking of their contents? |  |

Appendix J - Discrimination in Employment on Public Works

N.J.S.A. 10:2-1

10:2-1 Discrimination in Employment on Public Works;

Contract Provisions; Set-Aside Programs

* 1. In the hiring of persons for the performance of work under this contract or any subcontract hereunder, or for the procurement, manufacture, assembling or furnishing of any such materials, equipment, supplies or services to be acquired under this contract, no Contractor, nor any person acting on behalf of such Contractor or Subcontractor, shall, by reason of race, creed, color, national origin, ancestry, marital status, gender identity or expression, affectional or sexual orientation or sex, discriminate against any person who is qualified and available to perform the work to which the employment relates;
  2. No Contractor, Subcontractor, nor any person on its behalf shall, in any manner, discriminate against or intimidate any employee engaged in the performance of work under this contract or any subcontract hereunder, or engaged in the procurement, manufacture, assembling or furnishing of any such materials, equipment, supplies or services to be acquired under such contract, on account of race, creed, color, national origin, ancestry, marital status, gender identity or expression, affectional or sexual orientation or sex;
  3. There may be deducted from the amount payable to the Contractor by the contracting public agency, under this contract, a penalty of $50.00 for each person for each calendar day during which such person is discriminated against or intimidated in violation of the provisions of the contract; and
  4. This contract may be canceled or terminated by the contracting public agency, and all money due or to become due hereunder may be forfeited, for any violation of this section of the contract occurring after notice to the Contractor from the contracting public agency of any prior violation of this section of the contract.

Appendix V – New Jersey Turnpike Authority Requirements For Disabled Veteran-Owned Business Set-Aside Program For Construction Contracts

The following pages provide Bidders with information about the New Jersey Turnpike Authority (the “Authority”) Disabled Veteran-Owned Business (“DVOB”) Set-Aside Program requirements for non-federally funded construction contracts and subcontracts. Clarification of the DVOB specifications along with assistance in completing the required forms can be obtained by calling the Compliance Manager at the Authority’s Office of Equal Employment Opportunity (hereinafter “Office of EEO”) at (732) 750-5300 (ext. 8733).

CONTRACT CLAUSE

It is the policy of the Authority that DVOBs, as determined and defined by the State of New Jersey, Department of the Treasury, Division of Revenue and Enterprise Services (“Division”) in N.J.A.C. 17:14-1.1 et seq., have the opportunity to compete for and participate in the performance of contracts and subcontracts for construction services in accordance with the New Jersey Set-Aside Act for Disabled Veteran's Businesses, N.J.S.A. 52:32-31.1 et seq. (P.L. 2015, c. 116). The Authority further requires that its contractors shall agree to take all necessary and responsible steps, in accordance with the aforementioned regulations, to ensure that DVOBs have these opportunities.

This language is included to ensure that all persons who enter into any form of contractual agreement with the Authority are aware of their responsibilities and the commitment of the Authority to see that its Disabled Veteran-Owned Business Set-Aside Program (“Program”) is carried out in all instances.

EXPLANATORY NOTE

The following information is provided by the Authority to prospective Bidders in an effort to promote and encourage participation in its Program for businesses registered with the Division as a DVOB. The information provided below is not a complete reproduction of the regulations governing DVOB registration and participation. Accordingly, to the extent that any of the information contained below conflicts with the applicable regulations, the regulations shall govern. Interested parties are encouraged to obtain a complete copy of the applicable regulations (N.J.A.C. 17:14-1.1 et seq.) prior to registering with the Division and submitting bids to the Authority.

1. **Standards of eligibility for disabled veteran-owned businesses for goods and services and for State construction contracts**

See N.J.A.C. 17:14-2.1.

* 1. In order to be eligible as a disabled veteran-owned business, a business must satisfy the following criteria:
     1. The business must be independently owned and operated, as evidenced by its management being responsible for both its daily and long-term operation, and its management owning and controlling at least 51 percent interest in the business;
     2. The business must be incorporated or registered to do business in the State and have its principal place of business in New Jersey; and
     3. The business owner must have Federal certification from the Department of Veteran’s Affairs as having a service-connected disability.

1. **Obligation to provide information; penalties for failure to provide complete and accurate information (N.J.A.C. 17:14-2.2)**

See N.J.A.C. 17:14-14-2.2

* 1. Applicants under this chapter shall accurately and honestly supply all information required by the Division.
  2. When a business has been approved as a disabled veteran-owned business on the basis of false information knowingly supplied by the business, and the business has been awarded a State contract, or a subcontract thereto, the Unit, after notice and opportunity for a contested case hearing pursuant to N.J.S.A. 52:14B-1 et seq., and 52:14F-1 et seq., and N.J.A.C. 1:1, shall:
     1. Assess the business any difference between the contract amount and what the State's cost would have been if the contract had not been awarded in accordance with the provisions of N.J.S.A. 52:32-31 et seq.;
     2. Assess the business a penalty in the amount of 10 percent of the amount of the contract or subcontract involved;
     3. Order the business ineligible to transact any business with a State contracting agency for a period between three months and one year; and
     4. Order the Division to disallow the registration of the business as a disabled veteran-owned business for a period of one year from the State's database.
  3. Any business approved by the Division as a disabled veteran-owned business shall immediately apprise the Division of any circumstances that might affect the eligibility of the business under this chapter.
  4. The failure of a business to report any such changed circumstances, or the intentional and/or knowing reporting of false information, shall disqualify the business for inclusion in the database under this chapter for a period of one year.
  5. When a business has been registered as a disabled veteran-owned business on the basis of false information knowingly supplied by the business, but the business has not been awarded a State contract, the Unit, after notice and opportunity for a contested case hearing pursuant to N.J.S.A. 52:14B-1 et seq., and 52:14F-1 et seq., and N.J.A.C. 1:1, shall order the Division to disallow the registration of the business as a disabled veteran-owned business from the State's database for a period of one year.

1. **Registration procedures for disabled veteran-owned businesses**

See N.J.A.C. 17:14-3.1.

* 1. A business seeking to register as a disabled veteran-owned business shall comply with the following registration procedures:
     1. The business shall register at https://business.nj.gov, for Premier Business Services; and
     2. The business shall apply to the Division by completing the Vendor Registration Form, available online at https://business.nj.gov.
        1. As part of its application to the Division, a business shall document its principal place of business, independent status, number of employees, and its gross revenues. This documentation shall include all forms and reports requested by the Division on the Vendor Registration Form.
        2. If an applicant knowingly supplies inaccurate or false information, the application shall be denied under this chapter, the business shall be disqualified from inclusion in the disabled veteran-owned business database pursuant to N.J.A.C. 17:14-2.2, and the business may be subject to adverse action, including, but not limited to, debarment, suspension, or disqualification by contracting agencies, the Attorney General, or other enforcement agencies.
  2. When an application for registration as a disabled veteran-owned business has been completed, the Division shall determine whether to approve it and notify the business of its decision. If approved, the Division will issue the business a registration certification and add the business to the disabled veteran-owned business database.
  3. The disabled veteran-owned business database shall be used by State contracting agencies to confirm eligibility of a business for set-aside contracts and subcontracts and in reporting progress toward established contract award goals.
  4. Every five years, no later than 20 days prior to expiration of the disabled veteran-owned business's registration, and not earlier than 60 days prior to the expiration of such registration, a business interested in remaining registered as a disabled veteran-owned business shall comply with the registration procedures under (a) above.
  5. Annually, the business shall submit, prior to the anniversary of the registration notice, a verification statement, in which it shall attest that there has been no change in the ownership, revenue eligibility, or control of the business at the State's website, www.nj.gov/njbgs.
     1. If the business fails to submit the annual verification statement by the anniversary date of the registration notice, the registration will lapse and the business will be deemed revoked from the State's disabled veteran-owned business database. If the business seeks to be registered after revocation, it will have to reapply.
     2. If the business submits the annual verification statement by the anniversary date of the original registration notice, but either the verification statement or other information received by the Division indicates that the business is no longer eligible for registration as a disabled veteran-owned business, the Division shall revoke the registration pursuant to this chapter and following revocation, the business shall be deemed revoked from the State's disabled veteran-owned business database. The business may appeal this revocation pursuant to the procedures set forth at N.J.A.C. 17:14-3.4.

1. **Time for application to register as a disabled veteran-owned business**

See N.J.A.C. 17:14-3.2.

* 1. A business may apply to the Division at any time to be registered as a disabled veteran-owned business and to be placed on the disabled veteran-owned business database.
  2. If a business is to be eligible to bid on a specific set-aside contract or participate in the subcontracting goal programs for purposes of this chapter, it must be validly registered as a disabled veteran-owned business by the Division on or before the date the bid or proposal is due at the State contracting agency.

1. **Procedures for challenging a business registered as a disabled veteran-owned business**

See N.J.A.C. 17:14-3.3.

* 1. The qualification under this chapter of a business as a disabled veteran-owned business may be challenged by any third-party.
     1. A registration challenge shall be made in writing to the Unit, setting forth the factual basis for the challenge. The Unit shall provide a copy of the challenge and a notice granting the opportunity for a hearing to the challenged business. Where a particular contract is at issue, the Unit shall also provide a copy of the challenge to the contracting agency.
     2. A registration challenge to the Unit may concern only the qualification of the business under this chapter as a disabled veteran-owned business. Any challenge to a business's qualifications to perform a contract shall be referred to the appropriate State contracting agency.
  2. When the Unit receives a registration challenge, upon request of the business whose registration is at issue, the Unit Manager or a designee shall conduct a hearing on the matter as follows:
     1. The Unit shall notify all interested parties (including, but not limited to, the challenging party, the business whose registrations is at issue, and any affected State contracting agency) of the time and place of the hearing, and of the right to attend and be represented at the hearing.
     2. The burden of proof lies with the challenger to establish that the business whose registration is at issue is not qualified and/or not properly registered as a disabled veteran-owned small business under this chapter. However, the Unit may use its own resources to ascertain the validity of a challenge and the status of a business.
     3. The hearing will be conducted by the Unit Manager or his or her designee. The Unit Manager will issue a written report within seven working days following the close of the hearing.
     4. At the discretion of the Unit Manager or his or her designee, participants at the hearing may be permitted to file written exceptions to the report no later than five working days after the date on which the report is made available to the business.
     5. If no exceptions are filed, or permitted to be filed, under (b)4 above, the decision shall be final. If exceptions are filed under (b)4 above, after reviewing the exceptions, the Unit Manager will issue a final decision on the challenge and notify the parties by letter.
     6. A challenge to a business's eligibility shall not stay the contract award process.

1. **Procedures for denial, non-conferral, or revocation of registration as a disabled veteran-owned business**

See N.J.A.C. 17:14-3.4.

* 1. If the Division chooses to not confer or deny an application for a disabled veteran-owned business registration, or revokes a registration as a disabled veteran-owned business, the Division shall so notify the business. The denial or revocation is effective as of the date of the Division's notice to the business of its denial or revocation determination.
  2. When a business has been denied registration or has had its registration revoked, the business has the right to an appeal. The appeal procedures in this section govern denials and revocations, except for revocations on the basis of false information knowingly supplied by the business or failure to submit the annual verification statement. Revocation based on false information knowingly supplied by the business is addressed by the procedures at N.J.A.C. 17:14-2.2.
  3. Within 10 days from receipt of the denial or revocation notification, the business that received the notification may request, in writing to the Unit, an appeal hearing. The appeal may concern only the qualification of the business under this chapter as a disabled veteran-owned business. When the Division receives an appeal, it shall conduct a hearing on the matter as follows.
     1. The Unit shall notify the business of the time and place of the hearing and of the right of the business to appear and be represented by counsel at the hearing.
     2. The appeal request shall include all information, including any relevant documents, available to the appealing business relevant to the appeal.
     3. The burden of proof lies with the appealing business to show that the denial or revocation of the business registration was in error and that the appealing business meets all of the requisite qualifications under this chapter to be registered as a disabled veteran-owned business.
     4. `The hearing will be conducted by the Unit Manager or a designee. The Unit Manager shall issue a written report within seven days of the close of the hearing.
     5. At the discretion of the Unit Manager or his or her designee, the business may be permitted to file written exceptions to the report no later than five working days after the date on which the report is made available to the business.
     6. If no exceptions are filed, or permitted to be filed, under (c)5 above, the decision shall be final. If exceptions are filed under (c)5 above, after reviewing the exceptions, the Unit Manager shall issue a decision on the appeal and notify the business by fax (or other electronic means) and letter.

1. **Subcontracting goal program and procedures**

See N.J.A.C. 17:14-4.2.

* 1. When deemed appropriate, any State contracting agency, consistent with its contracting authority, may establish and administer a subcontracting goal program in lieu of, or as a supplement to, the set-aside program.
  2. Each State contracting agency shall maintain records regarding subcontracts awarded pursuant to this program. The procedures shall include the following provisions:
     1. The State contracting agency shall review its schedule of contracting opportunities and establish a method of determining which upcoming contracts are suitable for the subcontracting goal program.
        1. Factors to be considered when making the determination that a particular contract is suitable for inclusion in this program include, but are not limited to: the minimum number of contractors assigned to a commodity code, the total dollar amount of the Project and subcontracting opportunities on the Project, and the number of available eligible businesses in geographical proximity to the Project site.
        2. The designation of a particular RFP as a disabled veteran-owned business set-aside subcontracting opportunity shall be made prior to the public advertisement.
  3. For construction contracts, the State contracting agency shall review the Project to determine whether the disabled veteran-owned business set-aside goals are appropriate or can be reasonably attained given the elements of the job. The State contracting agency may review the Division's list of classified contractors to determine the number of eligible businesses, as established at N.J.A.C. 17:14-2.1, that may reasonably be expected to participate in the Project, giving consideration to the geographic location, required trades, and estimated dollar value of the Project.

1. The disabled veteran-owned business enterprise goal for construction projects set-aside can be reached either at the prime or subcontractor level.
2. The public advertisement shall include a notice to prospective bidders disclosing the disabled veteran-owned business goal for the contract.
3. Bidders shall provide sufficient documentation of its good faith efforts to meet the set-aside goal either with its bid or within 10 days of a request by the State contracting agency or other State agency. Failure to comply may preclude award of a contract to a bidder.
   1. [This is not applicable to construction contracts, so it is not part of this excerpt.]
   2. Each bidder awarded a contract for a procurement that contains the set-aside subcontracting goal requirement shall fully cooperate in any studies or surveys that may be conducted by the State contracting agency to determine the extent of the bidder's compliance with this chapter.
4. **Good faith efforts of bidders; requirements**

See N.J.A.C. 17:14-4.3.

* 1. The following actions shall be taken by a bidder in establishing a good faith effort to solicit and award subcontracts to eligible disabled veteran-owned businesses, as established in the RFP:
     1. The bidder shall attempt to locate qualified potential disabled veteran-owned business subcontractors;
     2. The bidder shall consult the disabled veteran business database if none are known to the bidder;
     3. The bidder shall keep a record of its efforts, including the names of businesses contacted and the means and results of such contacts, as well as documentation on any good faith efforts to solicit and award any subcontract to an eligible disabled veteran-owned business; and
     4. The bidder shall provide all potential subcontractors with detailed information regarding the specifications.

1. **Exemptions from set-aside program**

See N.J.A.C. 17:14-4.4.

In those circumstances where Federal law, rules, or regulations permit or require a procurement procedure other than those prescribed in this chapter, the State contracting agency shall follow the Federal procedures notwithstanding the provisions of this chapter, provided that the State contracting agency issues a written declaration that such Federal laws, rules, or regulations are in effect.

1. **Good faith efforts of Contractor**
   1. The Authority requires that SBE/DVOB Forms A, B, C and D, as applicable, which are located on the Authority website, be submitted within seven (7) days after Notice of Award. However, the Authority may extend the deadline for this requirement at its sole discretion.
   2. If the Contractor submits the SBE/DVOB forms within the requested timeframe, but fails to meet the DVOB goal, a fully completed and notarized SBE/DVOB Form D must be submitted, and the Authority will evaluate the efforts made by the Contractor to determine whether a demonstration of good faith efforts has been made.
2. **Post-Award Obligations**
   1. General Instructions:
      1. Refer to the Authority’s SBE/DVOB Participation Schedule (“Form A”). The listing of a DVOB firm by a Contractor on Form A shall constitute a representation by the Contractor to the Authority that such DVOB firm is qualified and not unavailable, and a commitment by the Contractor that it will enter into a subcontract with such DVOB firm for the portion of the work described in Form A and at the price set forth in its Bid. A DVOB Contractor which lists itself on Form A is committed to performing the work indicated with its own personnel.
      2. A database of DVOBs is maintained by the State, accessible via a link on the Division’s webpage at https://www20.state.nj.us/TYTR\_SAVI/vendorSearch.jsp; the database lists vendors by designation, including DVOBs, and is available for use by State contracting agencies and others in confirming eligibility for set-aside contracts and subcontracts and in reporting progress toward established contract award goals. Use of this listing does not relieve the Contractor of its responsibility to seek DVOB participation from other sources.
      3. Whenever the Authority issues Project Change Orders, the Authority may determine if increased DVOB participation will be required.
      4. If at any time the Contractor believes or has reason to believe that a proposed DVOB has become unavailable or, due to change in ownership or management responsibility, does not meet the standards set forth in Article II, the Contractor shall, within 10 days, notify the Authority of that fact. Within 15 days thereafter, the Contractor shall, if necessary to achieve the stated goal, make every reasonable effort to subcontract the same or other work to other DVOB firms.
      5. Should a DVOB become ineligible during the course of this Contract, effective as of the date of ineligibility, further contractual dollars expended with the DVOB shall not be counted toward the DVOB goal. Within 15 days after notification by the Authority to the Contractor of the ineligible DVOB, the Contractor shall make every reasonable effort to satisfy the DVOB goal. The Contractor’s effort to continue to meet the DVOB goal shall be coordinated with the Office of EEO.
      6. To ensure that all obligations under subcontracts awarded to DVOBs are met, the Authority shall review the prime Contractor’s DVOB involvement efforts during the performance of the contract. The Contractor shall monitor the performance of and collect and report data on DVOB participation to the Office of EEO. The form will be reviewed to determine Contract compliance with respect to the DVOB goal. Failure to submit this report may result in suspension of payments as provided in the section titled “Audit and Penalties” below. If, at any time, the Authority has reason to believe that any person or firm has willfully and knowingly provided incorrect information or made false statements, it shall refer the matter to the Attorney General of the State of New Jersey.
      7. The Contractor agrees to pay each subcontractor and supplier for satisfactory performance of its subcontract no later than ten (10) days from the receipt of each payment the Contractor receives from the Authority.
      8. In accordance with N.J.S.A. 52:32-41:
3. Prior to the issuance of a progress payment by a State agency to a prime Contractor, the prime Contractor shall certify to the State agency that a subcontractor or supplier has been paid any amount due from any previous progress payment and shall be paid any amount due from the current progress payment, or that there exists a valid basis under the terms of the subcontractor's or supplier's contract to withhold payment from the subcontractor or supplier and therefore payment is withheld.
4. If the prime Contractor withholds payment from a subcontractor or supplier, the prime Contractor shall provide to the subcontractor or supplier written notice of a withholding of payment. The notice shall detail the reason for withholding payment and state the amount of payment withheld. A copy of the notice shall be provided to the bonding company providing the performance bond for the general Contractor and to the State agency.
5. In addition to any amount due, a subcontractor or supplier shall also receive from a prime Contractor interest on the amount due at a rate equal to the prime rate plus 1% if a subcontractor or supplier is not paid within 10 calendar days after receipt by the prime Contractor of payment by a State agency for completed work which is the subject of a subcontract or a material supply agreement and if no valid basis exists for withholding payment. This interest shall begin to accrue on the 10th calendar day after receipt of payment by the prime Contractor. In addition, a subcontractor or supplier shall receive any court costs incurred by the subcontractor or supplier to collect payments withheld without a valid basis by the prime Contractor.
6. If court action is taken by a subcontractor or supplier to collect payments withheld by a prime Contractor and it is determined that a valid basis existed for the withholding of those payments, the subcontractor or supplier shall be liable for any court costs incurred by the prime Contractor in connection with the action.
   1. Substitution of DVOBs

Except as provided herein, the Contractor shall not have the work performed, or the materials or supplies furnished, by any other SVOB firm other than those named in Form A. However, the Contractor may, in unusual situations, be permitted to substitute a subcontractor(s). A request for substitution must be in writing, with complete justification for the request. The Contractor must have approval of the Authority before substitution of the DVOB subcontractor, regardless of the reason for the substitution. Failure to obtain approval from the Authority could result in the prime Contractor being found to be in “noncompliance” with the requirements of the contract. The term “unusual situations” includes, but is not limited to, a DVOB subcontractor’s or DVOB joint venture partners:

* + 1. Failure to qualify as a DVOB or maintain DVOB registration status.
    2. Death or physical disability, if the named subcontractor or DVOB partner of the joint venture is an individual.
    3. Dissolution, if a corporation or partnership.
    4. Bankruptcy of the subcontractor, subject to applicable bankruptcy laws, and only in instances where the bankruptcy affects the subcontractor’s ability to perform.
    5. Inability to obtain, or loss of, a license necessary for the performance of the particular category of work.
    6. Failure or inability to comply with a requirement of law applicable to the subcontract work.
    7. Material failure to comply with the terms and conditions of the subcontract.
    8. Material failure to successfully perform the subcontract tasks.

1. **Audit and Penalties**

The Contractor is advised that failure to carry out the requirements of these specifications shall constitute a breach of contract and may result in termination of the contract by the Authority, or such remedy as the Authority deems appropriate. During the performance of the contract, and for a period of up to three (3) years following completion of the contract work, the Authority may conduct reviews for compliance with the requirements of the DVOB Program. Such reviews may include the evaluation of monthly reports, desk audits and site visitations. Where a prime Contractor, or any Subcontractor, is found to be in noncompliance with the requirements of the DVOB Program during the performance of the contract, it will be required to take corrective action. If corrective action is not promptly taken by the offending Contractor, the following sanctions may be instituted (singularly, in any combination and in addition to any other remedies provided by law):

* + 1. The Authority may withhold further payments under the Contract.
    2. The Contract may be terminated for breach.
    3. Suspension or debarment proceedings may be commenced in accordance with New Jersey law and the Authority regulations.
    4. The Contract Bond may be enforced.

1. **The Authority Program: Post-Award Submittals**

Copies of the following forms are located on the Authority website*:*

* 1. Form A: SBE/DVOB Participation Schedule

List all DVOB firms scheduled to participate in the contract, including scope of work to be performed and the dollar value of their anticipated participation. Additionally, the name of the Contractor’s DVOB liaison officer should be included on this form. Upon execution of a contract with the Authority the prime Contractor must enter into a formal agreement with the DVOB(s) listed on Form A. There can be no substitution of the DVOB(s) listed on Form A without the prior written approval of the Authority. If, for any reason Form A is not completed, then the Contractor must complete and provide Form D (see below).

* 1. Form B: Intent to Perform as a Subcontractor (If applicable)

For each SBE or DVOB owned firm listed on Form A, Contractor shall include a complete and signed Form B. This Form B is not required for set aside contract awards, nor in cases wherein the Contractor is an SBE/DVOB itself.

* 1. Form C: Affidavit of SBE/DVOB

Each SBE or DVOB firm to be utilized must sign Form C attesting to its validity as a SBE or DVOB.

* 1. Form D: SBE/DVOB Unavailability Certification (if applicable)

If the Contractor is unable to identify SBE(s) or DVOB(s) as required to meet the targeted goal set for this Contract, the Contractor shall complete and attach this form which documents the Contractor’s good faith efforts to do so.

* 1. Form E: SBE/DVOB Certificate of Participation

This is the payment report that must be completed on a monthly basis by the Contractor, unless the Contractor is a DVOB itself

* 1. Form F: SBE/DVOB Certificate of Participation (Prime is SBE/DVOB)

If the Contractor is a SBE or DVOB itself, the Contractor shall complete this form and attach it with every Pay Estimate.

1. **Definitions (N.J.A.C. 17:14-1.2)**

The following words and terms, when used in this chapter, shall have the following meanings, unless the context clearly indicates otherwise.

"Bidder" means any individual or business entity submitting a proposal, quotation, or other offer to do business with the State of New Jersey in response to an invitation for bids.

"Bidding threshold" means the dollar limit placed on all public contracting agencies pursuant to N.J.S.A. 52:34-7 or 52:25-23 to establish when public advertisement of bids is required.

"Construction contract" means any contract to which the State or any State contracting agency is a party involving any construction, renovation, reconstruction, rehabilitation, alteration, conversion, extension, or demolition of or repair or other changes or improvements of any kind whatsoever to any State public structure or facility. The term also includes contracts for consultant services, supervision, inspection, and other functions incidental to actual construction.

"Consultant" means an architect, engineer, construction manager, or other provider of technical and professional services.

"Contractor" means any party awarded a contract or agreement to provide goods and services or design and/or construction services to the State of New Jersey.

"Delegated purchasing authority" means the authority of a State agency to award contracts below the bid threshold amount pursuant to authority delegated by the Director, Division of Purchase and Property (See N.J.S.A. 52:25-23) or for design and construction contracts pursuant to the authority delegated by the Director, Division of Property Management and Construction (see N.J.S.A. 52:34-7).

"Department" means the Department of the Treasury.

"Director" means the head of the Division of Revenue and Enterprise Services in the Department of the Treasury.

"Disabled veteran-owned business" means a business that has its principal place of business in the State, is independently owned and operated, and at least 51 percent of which is owned and controlled by persons who are disabled veterans or a business that has its principal place of business in this State and has been officially verified by the United States Department of Veterans' Affairs as a service disabled veteran-owned business for the purposes of Federal department contracts pursuant to Federal law.

"Disabled veteran business database" means the State database that is accessible via a link on the Division's webpage at www.nj.gov/njbgs; the database lists disabled veteran-owned businesses and is available for use by State contracting agencies and others in confirming eligibility for set-aside contracts and subcontracts and in reporting progress toward established contract award goals.

"Disabled veteran-owned business set-aside unit" or "Unit" means the section in the Department of the Treasury that provides oversight and direction for the disabled veteran-owned business set-aside program for the State of New Jersey.

"Division of Property Management and Construction" or "DPMC" means the division within the Department of the Treasury that provides a centralized design and construction contract procurement and administration service for other State agencies pursuant to N.J.S.A. 52:18A-151 et seq.

"Division of Purchase and Property" means the division within the Department of the Treasury that provides centralized procurement of goods and services for Executive Branch State agencies pursuant to N.J.S.A. 52:27B-56.

"Division of Revenue and Enterprise Services" or "Division" means the division in the Department of the Treasury that administers the registration of disabled veteran-owned business enterprises.

"Goal" means the statutorily determined percentage of contracting dollars awarded by each State contracting agency to disabled veteran-owned businesses in order to comply with the statutory set-aside provisions. It includes the percentage of State contracting dollars that the State contracting agency makes a good faith effort to award to disabled veteran-owned businesses.

"Invitation for Bids" or "IFB" means the document issued by a State contracting agency to initiate an advertised bidding and contract award process, and includes Requests for Proposals (RFPs). The IFB establishes the contract's terms and conditions, the product and/or service specifications, and the bidding eligibility to businesses approved as disabled veteran-owned business entities.

"Premier Business Services" means online business services provided via the State's business portal at www.nj.gov/njbusiness/home/pbs/, which include tax filing and payment services for which a business must register as part of its disabled veteran-owned business application.

"Principal place of business" means the location where 51 percent or more of a business' employees work, as evidenced by the payment of unemployment taxes, or the location where 51 percent or more of business operations occur, as supported by income or business tax returns.

"Registration" means the process by which any disabled veteran-owned business can have its eligibility for participation in the Department's disabled veteran-owned business programs determined.

"Request for Proposals" or "RFP" means the document issued by a State contracting agency to initiate an advertised bidding and contract award process.

"Set-Aside Act" means the New Jersey Set-Aside Act for Disabled Veteran's Businesses, N.J.S.A. 52:32-31.1 et seq. (P.L. 2015, c. 116).

"Set-aside contract," for the purposes of construing and applying the rules in this chapter only, means a contract, specifically designated by a contracting agency, in whole or in part, for award to a disabled veteran-owned business, which may include a component allowing the use of subcontractors to satisfy the requirements of a set-aside.

"State contracting agency" or "contracting agency" means any board, commission, committee, authority, division, department, college, or university of the State that possesses the legal authority to enter into or award contracts for goods and services or design and construction contracts.

"Subcontractor" means a third-party that is engaged by a Contractor to perform all or part of the goods, services, or construction services included in a contract with the State.

"Term contract" means an award made by a State contracting agency in which a source of supply for a product or service is established for a specific period of time. A term contract is generally applied when a State contracting agency:

1. Establishes a fixed unit price, hourly rate, or discount for items or services to be purchased thereunder;

2. Provides for some estimated dollar volume or minimum quantities to be purchased; or

3. Provides for the rebidding of any single purchase that exceeds a specified maximum amount.

"Treasurer" means the Treasurer of the State of New Jersey or his or her designee.

"Vendor Registration Form" means the form available via a link on the Division's website at www.nj.gov/njbgs, that a business completes when applying to register as a disabled veteran-owned business under this chapter.

"Veteran" means any citizen and resident of this State honorably discharged, or released under honorable circumstances, who served in any branch of the Armed Forces of the United States, or a Reserve component thereof, for at least 90 days and shall include disabled veterans.

Appendix X - New Jersey Turnpike Authority   
Requirements For Small Business Enterprise   
Subcontractors’ And Set-Aside Program   
For Construction Contracts

The following pages will provide Bidders with information about the New Jersey Turnpike Authority (the “Authority”) Small Business Enterprise (“SBE”) Program requirements for non-federally funded construction contracts and subcontracts. Clarification of the SBE specifications along with assistance in completing the required forms can be obtained by calling the Compliance Manager at the Authority’s Office of Equal Employment Opportunity (hereinafter “Office of EEO”) at (732) 750-5300 (ext. 8733).

CONTRACT CLAUSE

It is the policy of the Authority that SBEs, as determined and defined by the State of New Jersey, Department of the Treasury, Division of Revenue & Enterprise Services (“Division”) in N.J.A.C. 17:13-1.1 et seq., have the opportunity to compete for and participate in the performance of contracts and subcontracts for construction services. The Authority further requires that its contractors shall agree to take all necessary and responsible steps, in accordance with the aforementioned regulations, to ensure that SBEs have these opportunities.

This language is included to ensure that all persons who enter into any form of contractual agreement with the Authority are aware of their responsibilities and the commitment of the Authority to see that it’s SBE Policy is carried out in all instances.

EXPLANATORY NOTE

The following information is provided by the New Jersey Turnpike Authority (the “Authority”) to prospective Bidders in an effort to promote and encourage participation in its “Small Business Enterprise Program” (“Program”) for small businesses registered with the Division as a SBE. The information provided below is not a complete reproduction of the regulations governing SBE registration and participation. Accordingly, to the extent that any of the information contained below conflicts with the applicable regulations, the regulations shall govern. Interested parties are encouraged to obtain a complete copy of the applicable N.J.A.C. regulations 17:13-1.1 et seq. prior to registering with the State and submitting bids to the Authority.

1. **Standards of eligibility for small businesses for goods and services and for State construction contracts**

See N.J.A.C. 17:13-2.1.

1. In order to be eligible as a small business, a business must satisfy all of the following criteria:
2. The business must be independently owned and operated, as evidenced by its management being responsible for both its daily and long-term operation, and its management owning at least 51 percent interest in the business.
3. The business must be incorporated or registered todo business in the State and have its principal place of business in New Jersey, defined as such when either 51 percent or more of its employees work in New Jersey, as evidenced by the payment ofNew Jersey unemployment taxes or 51 percent or more of its business activities take place in New Jersey, as evidenced by its payment of income or business taxes.
4. The business must be a sole proprietorship, partnership, limited liability company, or corporation with 100 or fewer employees in full-time positions (35 hours or more not including seasonal and part-time employees employed for less than 90 days, if seasonal and casual part-time employment are common to that industry, and consultants employed under other contracts not related to the construction and construction-related services which are the subject of the specific contract for which the business wants to be eligible as a small business).
5. For goods and services contracts, the business must have gross revenues that do not exceed $12 million or the applicable Federal revenue standards established at 13 CFR 121.201, incorporated herein by reference, whichever is higher. For State construction contracts, the business must have gross revenues that do not exceed $3 million or the applicable annual revenue standards set forth in Federal regulation at 13 CFR 121.201, incorporated herein by reference, as may be adjusted periodically.
6. Gross revenues of a business which has been in business for three or more completed years means the revenues of the business over its last three completed tax years divided by three.
7. Gross revenues of a business which has been in business for less than three complete tax years means the revenues for the period the business has been in business divided by the number of weeks in business, multiplied by 52.
8. Gross revenues of a business which has been in business three or more complete tax years but has a short year as one of those years means the revenue for the short year and the two full years divided by the number of weeks in the short year and the two full years, multiplied by 52.
9. Eligibility is formalized by the Division’s registration and approval process.
10. Small businesses, for goods and services, will be registered in one of the following three categories:
11. Small businesses whose gross revenues do not exceed $500,000;
12. Small businesses whose gross revenues do not exceed $5 million; or
13. Small businesses whose gross revenues do not exceed $12 million or the applicable Federal revenue standards established at 13 CFR 121.201, incorporated herein by reference, whichever is higher.
14. Small businesses for State construction contracts will be registered in one of the following three categories:
15. Small businesses whose gross revenues do not exceed $3 million;
16. Small businesses whose gross revenues do not exceed 50 percent of the applicable annual revenue standards set forth in Federal regulation at 13 CFR 121.201 (see <https://www.ecfr.gov/current/title-13/chapter-I/part-121> ), incorporated herein by reference, and as may be adjusted periodically.
17. Small businesses whose gross revenues do not exceed the applicable annual revenue standards set forth in Federal regulation at 13 CFR 121.201, incorporated herein by reference, as may be adjusted periodically.
18. Small businesses properly registered in the category in (c)1 above will be eligible to participate in set-aside contracts and subcontracting programs available to businesses registered in the categories in (c)1, 2, and 3 above. Small businesses properly registered in the category in (c)2 above will be eligible to participate in set-side contracts and subcontracting programs available to businesses registered in the categories in (c)2 and 3 above. Small businesses properly registered in the category in (c)3 above will be eligible to participate in set-aside contracts and subcontracting programs available to businesses in the category in (c)3 above only.
19. Small businesses properly registered in the category in (d)1 above will be eligible to participate in set-aside contracts and subcontracting programs available to businesses registered in the categories in (d)1, 2, and 3 above. Small businesses properly registered only in the category in (d)2 above will be eligible to participate in set-aside contracts and subcontracting programs available to businesses registered in the categories in (d)2 and 3 above. Small businesses properly registered in the category in (d)3 above will be eligible to participate in set-aside contracts and subcontracting programs available to businesses registered only in the category in (d)3 above.
20. **Obligation to provide information and penalties for failure to provide complete and accurate information**

See N.J.A.C. 17:13-2.2.

* 1. Applicants under these rules shall accurately and honestly supply all information required by the Division.
  2. When a business has been approved as a small business on the basis of false information knowingly supplied by the business and the business has been awarded a State contract or a subcontract, the Small Business Set-Aside Unit, after notice and opportunity for a contested case hearing pursuant to N.J.S.A. 52:14B-10and N.J.A.C. 1:1, shall:

1. Assess the business any difference between the contract amount and what the State’s cost would have been if the contract had not been awarded in accordance with the provisions of N.J.S.A. 52:32-17 et seq.;
2. Assess the business a penalty in the amount of not more than 10 percent of the amount of the contract or subcontract involved;
3. Order the business ineligible to transact any business with a State contracting agency for a period of 12 months; and
4. Order the Division of Revenue and Enterprise Services to revoke the registration of the business as a small business for a period of one year from the State's small business database.
   1. Any business approved by the Division as a small business shall immediately apprise the Division of any circumstances which might affect the eligibility of the business under these rules.
   2. The failure of a business to report any such changed circumstances, or the intentional and/or knowing reporting of false information, shall disqualify the business for inclusion in the small business database under these rules and shall order the Division of Revenue and Enterprise Services to revoke the registration of the business as a small business for a period of one year from the State's small business database.
   3. When a business has been registered as a small business on the basis of false information knowingly supplied by the business, but the business has not been awarded a State contract, the Small Business Set-Aside Unit, after notice and opportunity for a contested case hearing pursuant to N.J.S.A. 52:14B-10 and N.J.A.C. 1:1, shall order the Division of Revenue and Enterprise Services to revoke the registration of the business as a small business for a period of one year from the State's small business database.
5. **Registration procedures for small businesses and veteran-owned businesses**

See N.J.A.C. 17:13-3.1.

* 1. A business seeking to register as a small business or a veteran-owned business shall comply with the following registration procedures:

1. The business shall register at [business.nj.gov](https://business.nj.gov), for Premier Business Services; and
2. The business shall apply to the Division by completing the Vendor Registration Form, available online at [business.nj.gov](https://business.nj.gov)
   1. As part of its application to the Division, a business shall document its principal place of business, independent status, number of employees, and its gross revenues. This documentation shall include appropriate forms or reports otherwise submitted to or issued by State and Federal agencies, such as employee reports filed with the New Jersey Department of Labor and Workforce Development or certificates of incorporation issued by the New Jersey Division of Revenue and Enterprise Services.
   2. If an applicant knowingly supplies inaccurate or false information, the application shall be denied under this chapter, the business shall be disqualified from inclusion in the small business database, and the business may be subject to adverse action by contracting agencies, the Attorney General or other enforcement agencies.
   3. As part of its application, the business shall pay a non-refundable $167.00 application fee for a five-year registration.
   4. When an application for registration as a small or veteran-owned business has been completed, the Division shall determine whether to approve it and notify the business of its decision. If approved, the Division will issue the business a registration certification and add the business to the small business database.
   5. The small business database shall be used by State contracting agencies in confirming eligibility for set-aside contracts and subcontracts and in reporting progress toward established contract award goals.
   6. Every five years, no later than 20 days prior to expiration of the small or veteran business's registration, and not earlier than 60 days prior to the expiration of such registration, a business interested in remaining registered as a small or veteran business shall comply with the registration procedures pursuant to (a) above.
   7. Annually the business shall submit, prior to the anniversary of the registration notice, an annual verification statement, in which it shall attest that there has been no change in the ownership, revenue eligibility, or control of the business at the State’s website <https://www.njportal.com/DOR/SBERegistry/>.
3. If the business fails to submit the annual verification statement by the anniversary date of the registration notice, the registration will lapse and the business will be deemed revoked from the State's small business database. If the business seeks to be registered after revocation, it will have to reapply and pay the $167.00 application fee.
4. If the business submits the annual verification statement by the anniversary date of the original registration notice, but either the verification statement or other information received by the Division indicates that the business is no longer eligible for registration as a small or veteran-owned business, the Division shall revoke the registration pursuant to this chapter and following revocation, the business shall be deemed revoked from the State's small business database. The business may appeal this revocation pursuant to the procedures set forth at N.J.A.C. 17:13-3.4.
5. **Time for application to register as a small or veteran-owned business**

See N.J.A.C. 17:13-3.2.

1. A business may apply to the Division at any time to be registered as a small or veteran-owned business and to be placed on the small business database.
2. If a business is to be eligible to bid on a specific set-aside contract or participate in the subcontracting target programs for purposes of this chapter, it must be registered as a small or veteran-owned business by the Division on or before the date the bid or proposal is due at the State contracting agency.
3. **Responsive Bid Criteria**
4. The Authority requires that SBE Forms A, B, C and D, as applicable, which are located on the Authority website, be submitted within seven (7) days after Notice Of Award. However, the Authority may extend the deadline for this requirement at its sole discretion.
5. **FAILURE TO TIMELY AND SATISFACTORILY COMPLETE THE SBE FORMS OR, IF THE GOAL IS NOT MET, TO SHOW GOOD FAITH EFFORTS TO MEET THE GOAL, SHALL RESULT IN A DETERMINATION BY THE AUTHORITY THAT THE BIDDER IS NON-RESPONSIVE AND SHALL CAUSE REJECTION OF THE BID.**
6. If the low Bidder submits the SBE forms within the requested time frame, but fails to meet the SBE goal, the Office of EEO, in conjunction with the Department of Engineering will evaluate the efforts made by the Bidder to determine whether a demonstration of Good Faith Efforts has been made.
7. Criteria used to evaluate the efforts made to obtain SBE participation are outlined in Article VI, Good Faith Efforts of Bidders Requirements.
8. **Good faith efforts of bidders; requirements**
9. The following actions shall be taken by a bidder in establishing a good faith effort to solicit and award subcontracts to eligible small businesses, as established in the RFP:
10. The bidder shall attempt to locate qualified potential small business subcontractors;
11. The bidder shall request a listing of small businesses from the Division if none are known to the bidder;
12. The bidder shall keep a record of its efforts, including the names of businesses contacted and the means and results of such contacts;
13. The bidder shall provide all potential subcontractors with detailed information regarding the specifications; and
14. The bidder shall attempt, wherever possible, to negotiate prices with potential subcontractors submitting higher than acceptable price quotes.
15. Bidders shall maintain adequate records to document their good faith efforts to solicit and award subcontracts to eligible small businesses, as established in the RFP, including those specific actions set forth in this subchapter.
16. **Counting SBE Participation**
17. Once a firm is determined to be an eligible SBE by the Division, the total dollar value of the contract awarded to the SBE shall be counted toward the applicable goal as follows:
18. The Authority will count towards its SBE goal only awards to SBEs that perform a commercially useful function in the work of a contract. This means that a SBE must be responsible for a distinct element of the work by actually performing, managing, and supervising the work involved. A SBE may, of course, enter into subcontracts. The subcontract values may be counted toward the SBE goal. However, if a SBE subcontracts a significantly greater portion of the work than is usual according to industry practices, it is presumed the SBE is not performing a commercially useful function and, therefore, the value of the SBE subcontract and its subcontracts will not be counted. The SBE may present evidence to the Authority to rebut this presumption.
19. No work shall be included in the SBE Participation Schedule if the Bidder has reasonable cause to believe the listed SBE firm will subcontract, at any tier, more than 49% to a non-SBE firm.
20. For construction contracts awarded under this program, 100% of the total contract amount will count toward the SBE Goal.
21. For contracts with SBE suppliers of goods and services, 100% of total contract amount will count toward the SBE goal.
22. Awards to SBE suppliers that are not manufacturers or regular dealers will be counted toward the goal on the following basis:
23. Fees or commission charged will be counted toward the goal for providing a bona fide service, such as professional, technical, consultant or managerial services and assistance in the procurement of essential personnel, facilities, equipment, materials or supplies required for performance of the contract.
24. If a SBE delivers equipment, materials and supplies required on a job site, the delivery fee charged may be counted toward the goal. Where such fees are a part of the SBE subcontract amount on a construction job, they have already been applied to the goal and cannot be further counted.
25. Fees or commissions charged for providing any bonds or insurance specifically required for the performance of the contract may be counted toward the goal, providing the aforementioned fees or commissions are determined by the Authority to be reasonable and not excessive as compared with fees customarily allowed for similar services.
26. Awards in subcontracts with businesses that are joint ventures will be counted on the basis of percentage ownership of the eligible SBE in the joint venture.
27. **Bid Requirements**
28. Pre-Bid Instructions:
29. The listing of a SBE firm by a Bidder on its SBE Participation Schedule (Form A) shall constitute a representation by the Bidder to the Authority that such SBE firm is qualified and not unavailable, and a commitment by the Bidder that, if it is awarded the contract, it will enter into a subcontract with such SBE firm for the portion of the work described in the SBE Participation Schedule and at the price set forth in its Bid. NO SUBSTITUTIONS OF SBE FIRMS DESIGNATED IN THE BIDDER’S SBE PARTICIPATION SCHEDULE MAY BE EFFECTED WITHOUT THE AUTHORITY’S PRIOR WRITTEN APPROVAL. A SBE Bidder which lists itself on the SBE Participation Schedule is committed to performing the work indicated with its own personnel.
30. Agreements between a Bidder and SBE in which SBE promises not to provide subcontracting quotations to other Bidders are prohibited.
31. Price alone shall not be an acceptable basis for rejecting a SBE Subcontractor’s bid, unless the Contractor evidences to the Authority’s satisfaction that no reasonable price could be obtained from the SBE.
32. A Directory of Small Business Enterprises is available in the Authority’s Office of EEO upon request. Use of this listing does not relieve the Bidder of its responsibility to seek SBE participation from other sources.
33. Post Award Obligations:
34. After the execution of a contract with the Authority, signed copies of subcontracts between the prime Contractor and SBE Subcontractors must be submitted to the Authority’s Office of EEO no later than 14 business days after the subcontract execution. The Prime Contract recipient shall inform the Authority of the anticipated job start date for all SBE Subcontractors prior to the start of same.
35. The agreement between the prime Contractor and Subcontractor shall remain firm for the duration of the contract. Should changes that affect the SBEs performance and/or compensation be required, the Authority’s Office of EEO, in conjunction with the Department of Engineering, must be notified for its review and approval of the changes prior to their implementation.
36. Whenever the Authority issues Project Change Orders, the Engineering Department, after consultation with the Office of EEO, will determine if increased SBE participation will be required.
37. If at any time the Contractor believes or has reason to believe that a proposed SBE has become unavailable or, due to change in ownership or management responsibility, does not meet the standards set forth in Article 2, the Contractor shall, within 10 days, notify the Authority of that fact in writing. Within 15 days thereafter, the Contractor shall, if necessary to achieve the stated goal, make every reasonable effort to subcontract the same or other work to other SBE firms. The Contractor’s efforts to replace an unavailable SBE firm shall be coordinated with the Authority’s Office of EEO.
38. Should a SBE become ineligible during the course of this contract, effective as of the date of ineligibility, further contractual dollars expended with the SBE shall not be counted toward the SBE goal. Within 15 days after notification by the Authority to the Contractor of the ineligible SBE, the Contractor shall make every reasonable effort to satisfy the SBE goal. The Contractor’s effort to continue to meet the SBE goal shall be coordinated with the Authority’s Office of EEO.
39. Within 15 days of a contract award, a SBE Liaison Officer must be designated by the Prime Contractor. The liaison officer will be responsible for cooperating with the Authority regarding SBE Subcontractor matters and will work with the office of EEO as necessary.
40. To ensure that all obligations under subcontracts awarded to SBEs are met, the Authority shall review the Prime Contractor’s SBE involvement efforts during the performance of the contract. The Contractor shall monitor the performance of and collect and report data on SBE participation to the Compliance Officer of the Office of EEO. The Contractor shall report the SBE status on the SBE Certificate of Participation form, a copy of which is attached to this Appendix, and submit it monthly to the Office of EEO. The Contractor must submit invoices or estimates to the Authority. SBEs must submit the appropriate forms on a monthly basis to the Office of EEO. The form will be reviewed to determine contract compliance with respect to the SBE goal. Failure to submit this report may result in suspension of payments as provided in Section D, “Audit and Penalties” below. If, at any time, the Authority has reason to believe that any person or firm has willfully and knowingly provided incorrect information or made false statements, it shall refer the matter to the Attorney General of the State of New Jersey.
41. The Contractor agrees to pay each Subcontractor and supplier under this contract for satisfactory performance of its contract no later than ten (10) days from the receipt of each payment the Contractor receives from the Authority.
42. In accordance with N.J.S.A. 52:32-41:

a. Prior to the issuance of a progress payment by a State agency to a prime Contractor, the prime Contractor shall certify to the State agency that a subcontractor or supplier has been paid any amount due from any previous progress payment and shall be paid any amount due from the current progress payment, or that there exists a valid basis under the terms of the subcontractor's or supplier's contract to withhold payment from the subcontractor or supplier and therefore payment is withheld.

b. If the prime Contractor withholds payment from a subcontractor or supplier, the prime Contractor shall provide to the subcontractor or supplier written notice of a withholding of payment. The notice shall detail the reason for withholding payment and state the amount of payment withheld. A copy of the notice shall be provided to the bonding company providing the performance bond for the general Contractor and to the State agency.

c. In addition to any amount due, a subcontractor or supplier shall also receive from a prime Contractor interest on the amount due at a rate equal to the prime rate plus 1% if a subcontractor or supplier is not paid within 10 calendar days after receipt by the prime Contractor of payment by a State agency for completed work which is the subject of a subcontract or a material supply agreement and if no valid basis exists for withholding payment. This interest shall begin to accrue on the 10th calendar day after receipt of payment by the prime Contractor. In addition, a subcontractor or supplier shall receive any court costs incurred by the subcontractor or supplier to collect payments withheld without a valid basis by the prime Contractor.

d. If court action is taken by a subcontractor or supplier to collect payments withheld by a prime Contractor and it is determined that a valid basis existed for the withholding of those payments, the subcontractor or supplier shall be liable for any court costs incurred by the prime Contractor in connection with the action.

1. Substitution of SBE’s

Except as provided herein, the successful Bidder shall not have the work performed, or the materials or supplies furnished, by any other SBE firm other than those named in the “Schedule of SBE Participation”. However, if the Authority finds that the Bidder upon submission of its bid, committed itself to the goal in good faith, the Bidder may, in unusual situations, be permitted to substitute a Subcontractor(s). A request for substitution must be in writing, with complete justification for the request. Whether the Contractor (or Bidder) seeks to make a substitution prior to award or during performance, the Contractor must have approval of the Authority before substitution of the SBE Subcontractor, regardless of the reason for the substitution. Failure to obtain approval from the Authority could result in the Prime Contractor being found to be in “noncompliance” with the requirements of the contract. The term “unusual situations” includes, but is not limited to, a SBE Subcontractor’s or SBE joint venture partners:

1. Failure to quality as a SBE, or maintain SBE registration status.
2. Death or physical disability, if the named Subcontractor or SBE partner of the joint venture is an individual.
3. Dissolution, if a corporation or partnership.
4. Bankruptcy of the Subcontractor, subject to applicable bankruptcy laws, and only in instances where the bankruptcy affects the Subcontractor’s ability to perform.
5. Inability to obtain, or loss of, a license necessary for the performance of the particular category of work.
6. Failure or inability to comply with a requirement of law applicable to the subcontract work.
7. Material failure to comply with the terms and conditions of the subcontract.
8. Material failure to successfully perform the subcontract tasks.
9. Audit and Penalties

The Prime Contractor is advised that failure to carry out the requirements of these specifications shall constitute a breach of contract and may result in termination of the contract by the Authority, or such remedy as the Authority deems appropriate. During the performance of the contract, and for a period of up to three (3) years following completion of the contract work, the Authority may conduct reviews for compliance with the requirements of the SBE Program. Such reviews may include the evaluation of monthly reports, desk audits and site visitations. Where a Prime Contractor, or any Subcontractor, is found to be in noncompliance with the requirements of the SBE Program during the performance of the contract, it will be required to take corrective action. If corrective action is not promptly taken by the offending Contractor, the following sanctions may be instituted (singularly, in any combination and in addition to any other remedies provided by law):

1. The Authority may withhold further payments under the contract.
2. The contract may be terminated for breach.
3. Suspension or debarment proceedings may be commenced in accordance with New Jersey law and the Authority regulations.
4. The relevant performance bond(s), if any, may be enforced.
5. **The Authority Program: Bid/Proposal Submittals**

Copies of the following forms are located on the Authority website:

1. Form A: SBE/DVOB Participation Schedule

List all SBE or DVOB firms scheduled to participate in the contract, including scope of work to be performed and the dollar value of their anticipated participation. Additionally, the name of the Contractor’s SBE/DVOB liaison officer should be included on this form.

Upon execution of a contract with the Authority the prime Contractor must enter into a formal agreement with the firms listed on Form A. There can be no substitution of the firms listed on Form A without the prior written approval of the Authority. If, for any reason Form A is not completed, then the Contractor must complete and provide Form D (see below).

1. Form B: Intent to Perform as a Subcontractor (if applicable)

For each SBE owned firm listed on Form A, Bidder shall include a complete and signed Form B. This form B is not required for set aside contract awards, nor in cases wherein the Bidder is an SBE or DVOB itself.

1. Form C: Affidavit of SBE/DVOB

Each SBE or DVOB firm to be utilized must sign Form C attesting to its validity as a SBE or DVOB.

1. Form D: SBE/DVOB Unavailability Certification (If applicable)

If a Contractor is unable to identify SBE(s) or DVOB(s) as required to meet the targeted goal set for this Contract, Contractor shall complete and attach this form which documents the Contractor’s Good Faith Efforts to do so.

1. Form E: SBE/DVOB Certificate of Participation

This is the payment report that must be completed on a monthly basis by the Contractor, unless the Contractor is an SBE or DVOB itself.

1. Form F: SBE/DVOB Certificate of Participation (Prime is SBE)

If the Contractor is an SBE or DVOB itself, the Contractor shall complete this form and attach it with every Pay Estimate.

1. **Definitions**

See N.J.A.C. 17:13-1.2

1. "**Construction Contract**" means any contract to which the Authority is a party involving any construction, renovation, reconstruction, rehabilitation, alteration, conversion, extension, or demolition of or repair or other changes or improvements of any kind whatsoever to any State public structure or facility. The term also includes contracts for consultant services, supervision, inspection, and other functions incidental to actual construction.
2. "**Consultant**" means an architect, Engineer, construction manager, or other provider of technical and professional services in support of the design or construction Project.
3. "**Contractor**" means any party under contract or agreement to provide goods and services, or design and/or construction services to the State of New Jersey.
4. "**Goal**" means the statutorily determined percentage of contracting dollars awarded by each State contracting agency to small businesses in order to comply with the small business provisions of the Set-Aside Act. It further means the percentage of State contracting dollars that the Authority makes a good faith effort to award to small businesses under Executive Order No. 84 (2006).
5. "**Registration**" means the process by which any small business or veteran-owned business can have its eligibility for participation in the Division's small business programs determined.
6. "**Set-aside contract**," for the purposes of construing and applying the rules in this chapter only, means a contract, specifically designated by the Authority, in whole or in part, for award to a small business either at a prime or subcontract level.
7. "**Small business**" means a business,which has its principal place of business in the State; is independently owned and operated; has no more than 100 full-time employees (35 hours or more, not including seasonal and part-time employees employed for less than 90 days, if seasonal and casual part-time employment are common to that industry, and consultants employed under other contracts not related to the goods and services which are the subject of the specific contract for which the business wants to be eligible as a small business) and for goods and services contracts, has gross revenues that do not exceed $12 million or the applicable Federal revenue standards established at 13 CFR 121.201, incorporated herein by reference, as may be adjusted periodically (see https://www.sba.gov/document/support-table-size-standards), and satisfies any additional eligibility standards under this chapter. For design and construction contracts, has gross revenues that do not exceed $3 million, or 50 percent of the applicable annual revenue standards set forth in Federal regulation at 13 CFR 121.201 (see https://www.sba.gov/document/support-table-size-standards) or whose gross revenues do not exceed the applicable annual revenue standards set forth in Federal regulation at 13 CFR 121.201, as may be adjusted periodically.
8. "**State Contracting Agency**" or "**Contracting Agency**" means any board, commission, committee, authority, division, department, college, or university of the State, which possesses the legal authority to enter into or award contracts for goods and services or design and construction contracts. A list of State contracting agencies shall be maintained at https://business.nj.gov, and updated as necessary to reflect the addition or elimination of agencies.
9. "**Subcontractor**" means a third party that is engaged by a Contractor to perform all or part of the goods, services, or construction services included in a contract with the Authority.
10. "**Target**" means the numerical objectives which the Authority contracting agency establishes, on a contract by contract basis, in order to meet its small business goal.

Appendix Z – Cost-Plus Work Forms

Standardized Schedules for Cost-Plus Work.

The below schedules are to be utilized by the Construction Firms under contractual agreement with the Authority. The Contractor is to prepare the schedules; once prepared, the Contractor forwards the document to the Resident Engineer (Supervision Consultant). The Resident Engineer will review and approve the amounts on Schedule A, Summary of Charges. The Project Engineer at the Authority will then indicate the amount paid on Schedule A, Summary of Charges. Refer to Subsection 108.04 for further instructions.

The following Schedules will be found electronically on the Authority’s website at <https://www.njta.gov/business-hub/construction-maintenance/> under “Information and Forms for Construction Contracts.”

**Schedule A – Summary of Charges**

Summarizes all schedules, the total charges will agree to cost plus amount billed. (Summarizes Schedule B, C, D and E)

**Schedule B – Daily Schedule of Labor Charges**

Documents the amount of hours each employee worked daily. The hourly rate is from Schedule B-1.

**Schedule B-1 – Calculation of Hourly Labor Rates**

Computation of Contractor's calculation for each Union classification labor rate. The total hourly rates should be transferred to Schedule B

**Schedule C – Daily Schedule of Equipment Charges**

Documents the amount of hours equipment was engaged in the performance of work and/or idle time. The Hourly Rates are from Schedules C-1 and C-2.

**Schedule C-1 – Calculation of Hourly Equipment Rate**

Describes Contractor's calculation for equipment rates. The hourly rate and hourly operating cost rate should be brought to Schedule C.

**Schedule C-2 – Calculation of Rented Equipment**

Documents hours rented equipment was used and invoice information. Total amount shall be brought to Schedule C.

**Schedule D – Daily Schedule of Material Charges**

Documents materials used for cost plus work. The Contractor shall attach copies of the invoices.

**Schedule E - Daily Schedule of Subcontractor Charges**

Documents Subcontractor charges for cost plus work.

**Schedule F – Inspector Report**

The standardized Inspector report is to be utilized by all Management Firms performing daily inspections for cost plus work. All information must be complete and the form must be signed daily by the inspector and the Contractor's representative at the job site.