

THE PORT AUTHORITY OF NY & NJ

PROCUREMENT DEPARTMENT
2 MONTGOMERY STREET, 3RD FL.
JERSEY CITY, NJ 07302

INVITATION FOR BID/PUBLIC BID OPENING

BID INFORMATION

ISSUED DATE: 12/05/2014

TITLE: APPLICATION AND REMOVAL OF THERMOPLASTIC
REFLECTORIZED PAVEMENT MARKINGS AT VARIOUS PORT
AUTHORITY FACILITIES.

BID NO.: 40707

SUBMIT SEALED BIDS BEFORE THE DUE DATE AND TIME TO THE ABOVE ADDRESS
WHERE THEY WILL BE PUBLICLY OPENED AND READ

BID DUE DATE: JANUARY 07, 2015

TIME: 11:00 AM

BUYER NAME: SRIVIDYA DESHPANDE

PHONE NO.: (201) 395-3449

FAX NO.: (201) 395-3425

EMAIL: sdeshpande@panynj.gov

BIDDER INFORMATION

(TO BE COMPLETED BY THE BIDDER)

(PLEASE PRINT)

(NAME OF BIDDING ENTITY)

(ADDRESS)

(CITY, STATE AND ZIP CODE)

(REPRESENTATIVE TO CONTACT-NAME & TITLE

(TELEPHONE)

(FEDERAL TAX I.D. NO.)

(FAX NO.)

BUSINESS CORPORATION PARTNERSHIP INDIVIDUAL

OTHER (SPECIFY): _____

INVITATION FOR BID

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- PART III – CONTRACT SPECIFIC TERMS AND CONDITIONS
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PART I - STANDARD INFORMATION FOR BIDDERS

1. General Information: The Port Authority of New York and New Jersey

The Port Authority of New York and New Jersey (the “Port Authority” or the “Authority”) is an agency of the States of New York and New Jersey, created and existing by virtue of the Compact of April 30, 1921, made by and between the two States, and thereafter consented to by the Congress of the United States. It is charged with providing transportation, terminals and other facilities of trade and commerce within the Port District. The Port District comprises an area of about 1,500 square miles in both States, centering about New York Harbor. The Port District includes the Cities of New York and Yonkers in New York State, and the cities of Newark, Jersey City, Bayonne, Hoboken and Elizabeth in the State of New Jersey, and over 200 other municipalities, including all or part of seventeen counties, in the two States. The Port Authority manages and/or operates all of the region’s major commercial airports (Newark Liberty International, John F. Kennedy International, Teterboro, LaGuardia, Atlantic City International, and Stewart International Airports), marine terminals in both New Jersey and New York (Port Newark and Elizabeth, Howland Hook and Brooklyn Piers); and its interstate tunnels and bridges (the Lincoln and Holland Tunnels; the George Washington, Bayonne, and Goethals Bridges; and the Outerbridge Crossing), which are vital “Gateways to the Nation.”

In addition, the Port Authority operates the Port Authority Bus Terminal in Manhattan, the largest facility of its kind in the world, and the George Washington Bridge and Journal Square Transportation Center bus stations. A key link in interstate commuter travel, the Port Authority also operates the Port Authority Trans-Hudson Corporation (PATH), a rapid rail transit system linking Newark, and the Jersey City and Hoboken waterfronts, with midtown and downtown Manhattan. A number of other key properties are managed by the agency including but not limited to a large satellite communications facility (the Teleport) in Staten Island, and a resource recovery co-generation plant in Newark. Prior to September 11, 2001, the Port Authority’s headquarters were located in the World Trade Center, and that complex is still owned and being partially redeveloped by the Authority.

2. Form and Submission of Bid

The Bidder shall review carefully every provision of this document, provide all the information required, and sign and return one entire copy to the Port Authority in accordance with the instructions on the Cover Sheet and Part II – Contract Specific Information for Bidders. The Bidder should retain one complete duplicate copy for its own use. The “Signature Sheet” contained herein must be completed and signed by the Bidder. The Pricing Sheet(s) contained herein must also be completed. The Bid shall be sealed in the enclosed self-addressed envelope conspicuously marked with the Bidder’s name, address, and Vendor Number, if available. In addition, the outside of the package must clearly state the Bid Title, the Bid Collective Number and the Bid Due Date. Failure to properly label submissions may cause a delay in identification, misdirection or disqualification of the submissions. In submitting this bid, the Bidder offers to assume the

obligations and liabilities imposed upon it herein and expressly makes the representations and warranties required in this document.

All Bids must be received by the bid custodian on or before the due date and time specified on the cover page, at which time they will be publicly opened and read. Bids are only accepted Monday through Friday, excluding Port Authority holidays, between the hours of 8:00 a.m. and 5:00 p.m., via (1) regular mail, (2) express delivery service (e.g. UPS), or (3) hand delivery. If your Bid is to be hand-delivered by messenger or you are planning to attend the formal bid opening, please note that only individuals with valid photo identification will be permitted access to the Port Authority's offices. Individuals without valid identification shall be turned away and their packages not accepted. Bids that are not received by the bid custodian by the scheduled bid opening date will be considered late.

3. Vendor Profile

To ensure maximum opportunities, it is vitally important that Bidders keep their vendor profiles up to date with an appropriate e-mail address, as this will enable their firm to receive timely notice of advertisements, reminders, solicitations and addenda. Bidders may update their vendor profile or register as a Port Authority Vendor by accessing the online registration system at <https://panynjprocure.com/VenLogon.asp>.

4. Acknowledgment of Addenda

If any Addenda are posted or sent as part of this Bid, the Bidder shall complete, sign and include with its Bid the addenda form(s). In the event any Bidder fails to conform to these instructions, its Bid will nevertheless be construed as though the Addenda had been acknowledged.

If the Bidder downloaded this solicitation document, it is the responsibility of the Bidder to periodically check the Port Authority website at <http://www.panynj.gov/business-opportunities/bid-proposal-advertisements.html> and download any addenda that might have been issued in connection with this solicitation.

5. Firm Offer

The Bidder offers to provide the Port Authority of New York and New Jersey the services and to perform all Work in connection therewith required under this Contract, all as specified by the terms and conditions of the Contract, based on the Pricing Sheets provided herein.

EXCEPTIONS TAKEN OR CONDITIONS IMPOSED BY A BIDDER TO ANY PORTION OF THE CONTRACT DOCUMENTS WILL RESULT IN REJECTION OF THE BID.

6. Acceptance or Rejection of Bids

The acceptance of a Bid will be by a written notice signed by an authorized representative on behalf of the Authority. No other act of the Port Authority, its Commissioners, officers, agents or employees shall constitute acceptance of a Bid. The

Port Authority reserves the unqualified right, in its sole and absolute discretion, to reject any or all Bids or to accept any Bid, which in its judgment will best serve the public interest and to waive defects in any Bid. No rights accrue to any Bidder unless and until its Bid is accepted.

7. Bidder's Questions

Any questions by prospective Bidders concerning the Work to be performed or the terms and conditions of the Contract may be addressed to the Contracts Specialist listed on the Cover Sheet of this document. The Contracts Specialist is only authorized to direct the attention of prospective Bidders to the portions of the Contract. No employee of the Port Authority is authorized to interpret any portion of the Contract or to give information in addition to that contained in the Contract. When Contract interpretation or additional information as to the Contract requirements is deemed necessary by the Port Authority, it will be communicated to all Bidders by written addenda issued under the name of the Assistant Director, Commodities & Services Division, Procurement Department of the Port Authority and may be posted on the Port Authority website. Addenda shall be considered part of the Contract.

8. Additional Information To and From Bidders

Should the Authority require additional information from the Bidder in connection with its bid, such information shall be submitted within the time frame specified by the Port Authority.

If the Bidder is a corporation, a statement of the names and residences of its officers should be submitted on the Name and Residence of Principals Sheet, directly following the Signature Sheet.

9. Union Jurisdiction

All prospective Bidders are advised to ascertain whether any union now represented or not represented at the Facility will claim jurisdiction over any aspect of the operations to be performed hereunder and their attention is directed to the paragraph entitled "Harmony" in the Standard Contract Terms and Conditions.

10. Assessment of Bid Requirements

The Bidder should carefully examine and study the entire contents of these bid documents and shall make its own determinations as to the services and materials to be supplied and all other things required to be done by the Contractor.

11. Bidder's Prerequisites

Only Bids from Bidders that can satisfactorily demonstrate meeting the prerequisites specified within Part II hereof at the time of bid submission will be considered. By furnishing this document to the Bidder, the Port Authority has not made a determination that the Bidder has met the prerequisites or has otherwise been deemed qualified to perform the services. A determination that a Bidder has met the prerequisites is no assurance that it will be deemed qualified in connection with other bid requirements included herein.

12. Qualification Information

The Port Authority may give oral or written notice to the Bidder to furnish the Port Authority with information and to meet with designated representatives of the Port Authority relating to the Bidder's qualifications and ability to fulfill the Contractor's obligations hereunder. The requested information shall be submitted no later than three (3) days after said notice unless otherwise indicated. Matters upon which the Port Authority may inquire may include, but may not be limited to, the following:

a. The Bidder may be required to demonstrate that it is financially capable of performing this Contract, and the determination of the Bidder's financial qualifications will be made by the Port Authority in its sole discretion. The Bidder shall submit such financial and other relevant information as may be required by the Port Authority from time to time including, but not limited to, the following:

1. (i) Certified financial statements, including applicable notes, reflecting the Bidder's assets, liabilities, net worth, revenues, expenses, profit or loss and cash flow for the most recent calendar year or the Bidder's most recent fiscal year.

(ii) Where the certified financial statements set forth in (i) above are not available, then either reviewed or compiled statements from an independent accountant setting forth the aforementioned information shall be provided.

(iii) Where neither certified financial statements nor financial statements from an independent accountant are available, as set forth in (i) and (ii) above, then financial statements containing such information prepared directly by the Bidder may be submitted; such financial statements, however, must be accompanied by a signed copy of the Bidder's most recent Federal income tax return and a statement in writing from the Bidder, signed by an executive officer or their authorized designee, that such statements accurately reflect the present financial condition of the Bidder.

Where the statements submitted pursuant to subparagraphs (i), (ii) or (iii) are dated prior to forty-five (45) days before the bid opening, then the Bidder shall submit a statement in writing, signed by an executive officer of the Bidder or their designee, that the present financial condition of the Bidder is at least as good as that shown on the statements submitted.

2. Bidder's statement of work on hand, including any work on which a bid has been submitted, and containing a description of the work, the annual dollar value, the location by city and state, the current percentage of completion, the expected date for completion, and the name of an individual most familiar with the Bidder's work on these jobs.

3. The name and address of the Bidder's banking institution, chief banking representative handling the Bidder's account, the Bidder's Federal Employer Identification Number (i.e., the number assigned to firms by the Federal Government for tax purposes), the Bidder's Dun and Bradstreet number, if any,

the name of any other credit service to which the Bidder has furnished information, and the number, if any, assigned by such service to the Bidder's account.

- b. Information relating to the Bidder's Prerequisites, if any, as set forth in this document.
- c. If the Bidder is a corporation: (1) a copy of its Certificate of Incorporation and, if applicable, all Amendments thereto with a written declaration signed by the Secretary of the Corporation with the corporate seal affixed thereto, stating that the copy furnished is a true copy of the Certificate of Incorporation and any such Amendments as of the date of the opening of the bid and (2) if the Bidder is not incorporated under the laws of the state in which the service is to be performed, a certificate from the Secretary of State of said state evidencing the Bidder's legal qualification to do business in that state.
- d. A statement setting forth the names of those personnel to be in overall charge of the service and those who would be exclusively assigned to supervise the service and their specific roles therein, setting forth as to each the number of years of experience and in which functions and capacities each would serve.
- e. Information to supplement any statement submitted in accordance with the Standard Contract Terms and Conditions entitled "Contractor's Integrity Provisions."
- f. In the event that the Bidder's performance on a current or past Port Authority or Port Authority Trans-Hudson Corporation (PATH) contract or contracts has been rated less than satisfactory, the Manager, Purchasing Services Division, may give oral or written notice to the Bidder to furnish information demonstrating to the satisfaction of such Manager that, notwithstanding such rating, such performance was in fact satisfactory or that the circumstances which gave rise to such unsatisfactory rating have changed or will not apply to performance of this Contract, and that such performance will be satisfactory.
- g. The Bidder recognizes that it may be required to demonstrate to the satisfaction of the Port Authority that it in fact can perform the services as called for in this Contract and that it may be required to substantiate the warranties and representations set forth herein and the statements and assurances it may be required to give.

Neither the giving of any of the aforesaid notices to a Bidder, the submission of materials by a Bidder, any meeting which the Bidder may have with the Port Authority, nor anything stated by the Port Authority in any such meeting shall be construed or alleged to be construed as an acceptance of said Bidder's Bid. Nothing stated in any such meeting shall be deemed to release any Bidder from its offer as contained in the bid documents.

13. Contractor's Integrity Provisions

By submitting a Bid, Bidders shall be deemed to have made the certifications contained in the clauses entitled "Certification of No Investigation (criminal or civil anti-trust), Indictment, Conviction, Debarment, Suspension, Disqualification and Disclosure of Other Information," and "Non-Collusive Bidding, and Code of Ethics Certification, Certification of No Solicitation Based On Commission, Percentage, Brokerage, Contingent or Other Fees" contained within the Standard Terms and Conditions within these bid documents. If the Bidder is unable to make the certifications contained therein the Bidder shall submit a statement with its Bid explaining why any such certification(s)

cannot be made. Such a submission shall be submitted in a separate envelope along with your Bid, clearly marked "CERTIFICATION STATEMENT."

14. Facility Inspection

Details regarding the Facility inspection for all parties interested in submitting a bid are stipulated in Part II hereof. All Bidders must present company identification and photo identification for access to the Facility.

15. Available Documents - General

Certain documents, listed in Part II hereof, will be made available for reference and examination by Bidders either at the Facility Inspection, or during regular business hours. Arrangements to review these documents at a time other than the Facility Inspection may be made by contacting the person listed in Part II as the contact for the Facility Inspection.

These documents were not prepared for the purpose of providing information for Bidders upon this Contract but they were prepared for other purposes, such as for other contracts or for design purposes for this or other contracts, and they do not form a part of this Contract. The Port Authority makes no representation or guarantee as to, and shall not be responsible for, their accuracy, completeness or pertinence, and, in addition, shall not be responsible for the inferences or conclusions to be drawn there from.

16. Pre-award Meeting

The lowest qualified Bidder may be called for a pre-award meeting prior to award of the Contract.

17. Price Preference

A price preference may be available for Minority/Women Business Enterprises (M/WBEs) or Small Business Enterprises (SBEs) as set forth in the Standard Contract Terms and Conditions.

18. M/WBE Subcontracting Provisions

The Port Authority has a long-standing practice of making its business opportunities available to Minority Business Enterprises (MBEs) and Women-Owned Businesses (WBEs) and has taken affirmative steps to encourage such firms to seek business opportunities with the Port Authority. The successful Bidder will use good faith efforts to provide for meaningful participation by the Port Authority certified M/WBEs as defined in this document, in the purchasing and subcontracting opportunities associated with this contract, including purchase of equipment, supplies and labor services.

Minority Business Enterprise (MBE) - means a business entity which is at least fifty one percent (51%) owned and controlled by one or more members of one or more minority groups, or, in the case of a publicly held corporation, at least fifty one percent (51%) of the stock of which is owned by one or more minority groups, and whose management and daily business operations are controlled by one or more such individuals who are citizens or permanent resident aliens.

"Minority Group" means any of the following racial or ethnic groups:

- (a) Black persons having origins in any of the Black African racial groups not of Hispanic origin;
- (b) Hispanic persons of Mexican, Puerto Rican, Dominican, Cuban, Central or South American culture or origin, regardless of race;
- (c) Asian and Pacific Islander persons having origins in any of the original peoples of the Far East, Southeast Asia, The Indian Subcontinent, or the Pacific Islands;
- (d) Native American or Alaskan native persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification.

Women-Owned Business Enterprise (WBE) - means a business enterprise which is at least fifty one percent (51%) owned by one or more women, or, in the case of a publicly held corporation, at least fifty one percent (51%) of the stock of which is owned by one or more women and whose management and daily business operations are controlled by one or more women who are citizens or permanent or resident aliens.

Good faith efforts to include participation by M/WBEs shall include, but not be limited to the following:

- 1) Dividing the services and materials to be procured into small portions where feasible;
- 2) Giving reasonable advance notice of specific subcontracting and purchasing opportunities to such firms as may be appropriate;
- 3) Soliciting services and materials from M/WBEs, which are certified by the Port Authority;
- 4) Ensuring that provision is made for timely progress payments to the M/WBEs and;
- 5) Observance of reasonable commercial standards of fair dealing in the respective trade or business.

Bidders are directed to use form PA3749B as the recording mechanism for the M/WBE participation Plan, which may be downloaded at <http://www.panynj.gov/business-opportunities/become-vendor.html>

The M/WBE Plan submitted by the Contractor to the Port Authority shall contain, at a minimum, the following:

- Identification of M/WBE's: Provide the names and addresses of all M/WBEs included in the Plan. If none are identified, describe the process for selecting participant firms in order to achieve the good faith goals under this Contract.
- Level of Participation: Indicate the percentage of M/WBE participation expected to be achieved with the arrangement described in the Plan.
- Scope of Work: Describe the specific scope of work the M/WBE's will perform.

- Previous M/WBE Participation: Describe any previous or current M/WBE participation, which the Bidder has utilized in the performance of its contracts.

All M/WBE subcontractors listed on the M/WBE Participation Plan must be certified by the Port Authority in order for the Contractor to receive credit toward the M/WBE goals set forth in this Contract. Please go to www.panynj.gov/supplierdiversity to search for M/WBEs by a particular commodity or service. The Port Authority makes no representation as to the financial responsibility of such firms or their ability to perform Work under this Contract.

Bidders shall include their M/WBE Participation Plan with their Bids, to be reviewed and approved by the Authority's Office of Business Diversity and Civil Rights (OBDCR).

If the Contractor wishes to subcontract a portion of the Work through a firm not listed in the Directory, but which the Contractor believes should be eligible because it is (1) an M/WBE, as defined above and (2) competent to perform portions of the Work, the Contractor shall submit an M/WBE Uniform Certification Application to the Port Authority of New York and New Jersey, Office of Business Diversity and Civil Rights (OBDCR), 233 Park Avenue South, 4th Floor, New York, NY 10003. The application is available online at www.panynj.gov/supplierdiversity. In addition, to update your certification file and to advise OBDCR of changes to any information, please email these changes to certhelp@panynj.gov. Credit toward applicable goals will be granted only to Port Authority certified vendors. For more information about M/WBE Programs, call (212) 435-7888.

19. Certification of Recycled Materials

Bidders are requested to submit, with their bid, a written certification entitled "Certified Environmentally Preferable Products / Practices" attached hereto as "Attachment I-A", attesting that the products or items offered by the Bidder contain the minimum percentage of post-consumer recovered material in accordance with the most recent guidelines issued by the United States Environmental Protection Agency (EPA), or, for commodities not so covered, the minimum percentage of post-consumer recovered materials established by other applicable regulatory agencies. The data submitted by the Bidder in Attachment I-A is being solicited for informational purposes only.

Recycling Definitions:

For purposes of this numbered section, the following definitions shall apply:

- a. "Recovered Material" means any waste material or by-product that has been recovered or diverted from solid waste, excluding those materials and by-products generated from, and commonly reused within, an original manufacturing process.
- b. "Post-consumer Material" means any material or finished product that has served its intended use and has been discarded for disposal or recovery having completed its life as a consumer item. "Post-consumer material" is included in the broader category of "Recovered Material".
- c. "Pre-consumer Material" means any material or by-product generated after the manufacture of a product but before the product reaches the consumer,

such as damaged or obsolete products. Pre-consumer Material does not include mill and manufacturing trim, scrap, or broken material that is generated at a manufacturing site and commonly reused on-site in the same or another manufacturing process.

d. "Recycled Product" means a product that contains the highest amount of post-consumer material practicable, or when post-consumer material is impracticable for a specific type of product, contains substantial amounts of Pre-consumer Material.

e. "Recyclable Product" means the ability of a product and its packaging to be reused, reconditioned for use, or recycled through existing recycling collection programs.

f. "Waste Reducing Product" means any product that will result in less waste generated due to its use rather than another product designed to serve the same function with an greater waste generation rate. This shall include, but not be limited to, those products that can be reused, refilled or have a longer life expectancy and contain a lesser amount of toxic constituents.

20. City Payroll Tax

Bidders should be aware of the payroll tax imposed by the:

- a. City of Newark, New Jersey for services performed in Newark, New Jersey;
- b. City of New York, New York for services performed in New York, New York; and
- c. City of Yonkers, New York for services performed in Yonkers, New York.

These taxes, if applicable, are the sole responsibility of the Contractor. Bidders should consult their tax advisors as to the effect, if any, of these taxes. The Port Authority provides this notice for informational purposes only and is not responsible for either the imposition or administration of such taxes. The Port Authority exemption set forth in the Paragraph headed "Sales or Compensating Use Taxes", in the Standard Contract Terms and Conditions included herein, does not apply to these taxes.

21. Additional Bidder Information

Prospective Bidders are advised that additional vendor information, including but not limited to, forms, documents and other information, including protest procedures, may be found on the Port Authority website at: <http://www.panynj.gov/business-opportunities/become-vendor.html>

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PART II - CONTRACT SPECIFIC INFORMATION FOR BIDDERS

The following information may be referred to in other parts hereof, or further detailed in other parts hereof, if applicable.

1. Service(s) Required

Application and removal of thermoplastic, epoxy, pre-formed, paint and snowplowable reflectorized pavement markings at various Port Authority facilities.

2. Location(s) Services Required

The following are the facilities that this Contract will service:

NJMT	Port Newark Marine Terminals, NJ
NYMT	Brooklyn Marine Terminal, NY
JFK	John F. Kennedy International Airport, NY
LGA	LaGuardia Airport, NY
EWR	Newark Liberty International Airport, NJ
GWB	George Washington Bridge
HT	Holland Tunnel
LT	Lincoln Tunnel
SIB	Staten Island Bridges

as more fully described in the definition of "Facility" in Part V of this Agreement (the "Specifications").

3. Expected Date of Commencement of Contract

On or about February 1, 2015.

4. Contract Type

Unit Price Service Contract.

5. Duration of Contract

Two (2) year Contract expiring on or about January 31, 2017.

6. Option Period(s)

There shall be up to one (1), one (1) year Option Period.

7. Price Adjustment during Option Period(s) (Index Based)

Price adjustment during the Option Period(s) shall be pursuant to the clause entitled "Price Adjustment" in Part III hereof.

8. Specific Bidder's Prerequisites

- a. The Bidder shall have had at least three (3) year(s) of continuous experience immediately prior to the date of submission of its bid in the management and operation of a business engaged in the installation and removal of thermoplastic, epoxy, pre-formed markings, paint and snowplowable markers and during that time shall have actually engaged in providing said or such services to commercial or industrial accounts under contract. The Bidder may fulfill this prerequisite if the Bidder can demonstrate to the satisfaction of the Port Authority that the persons or entities owning and controlling the Bidder have had a cumulative total of at least three (3) year(s) of experience immediately prior to the date of the submission of its bid in the management and operation of a business actually engaged in providing these services to commercial or industrial accounts under contract during that time, or have owned and controlled other entities which have actually engaged in providing the above described services during that time period.
- b. During the time period stated in (a) above, the Bidder, or persons or entities owning and controlling the Bidder, shall have satisfactorily performed or be performing under at least two (2) Contract(s) requiring similar services of similar scope to those required under this Contract.
- c. The Bidder shall have had in its last fiscal year, or the last complete calendar year immediately preceding the opening of its bid, a minimum of \$500,000 annual gross income from the type of service required under this Contract.
- d. In the event a bid is submitted by a joint venture the foregoing prerequisites will be considered with respect to such Bid as follows: The prerequisite in subparagraph (a) and (b) above, will be considered satisfied if the joint venture itself, or any of its participants individually, can meet the requirements. The prerequisite in subparagraph (c) above, will be considered satisfied if the gross income of the joint venture itself meets the prerequisite or the gross income of the participants in the joint venture cumulatively meets the prerequisite. If a joint venture which has not been established as a distinct legal entity submits a bid, it and all participants in the joint venture shall be bound jointly and severally and each such participant in the joint venture shall execute the bid and do each act and thing required by this Invitation for Bid. On the original bid and wherever else the Bidder's name would appear, the name of the joint venture Bidder should appear if the joint venture is a distinct legal entity. If the Bidder is a common law joint venture, the names of all participants should be listed followed by the words "acting jointly and severally". All joint venture Bidders must provide documentation of their legal status.

Proof that the above prerequisites are met should be submitted with the bid.

9. Available Documents

The following documents will be made available for reference and examination at the Port Authority Sign Shop Supervisors office upon request by calling Michael Moroney at (973) 589-7870 or emailing him at mmoroney@panynj.gov :

Contract 4600008985 entitled “Application and Removal of Thermoplastic Reflectorized Pavement Markings at Various Port Authority Facilities”.

10. Contractor Staff Background Screening

The Contractor awarded this Contract may be required to have its staff, and any subcontractor’s staff working under this Contract, authorize the Authority or its designee to perform background checks. Such authorization shall be in a form acceptable to the Authority. The Contractor (and subcontractor) may also be required to use an organization designated by the Authority to perform the background checks. The cost for said background checks for staff that pass and are granted a credential shall be reimbursable to the Contractor (and its subcontractors) as an out-of-pocket expense. Costs associated with background checks for staff that are rejected for a credential for any reason are not reimbursable.

As of January 29, 2007, the Secure Worker Access Consortium (S.W.A.C.) is the only Port Authority approved provider to be used to conduct background screening, except as otherwise required by federal law and/or regulation. Information about S.W.A.C., instructions, corporate enrollment, online applications, and location of processing centers can be found at <http://www.secureworker.com>, or S.W.A.C. may be contacted directly at (877)522-7922.

11. Equipment

The bidder shall supply the following information with the bid documents:

The bidder shall submit multiple pictures of their long line striping equipment and attenuator trucks along with the make, model and year of the vehicles that will be made available for the installation of pavement striping at Port Authority facilities. All equipment assigned to this Contract shall be registered and road worthy motor vehicles.

12. Aids to Bidders

As an aid to Bidders in determining the appropriate amount of materials required in the performance of this Contract, the Port Authority provides the following estimate of the Contract quantity proportions that will be required at each Facility. The Port Authority makes no representation, guarantees or warranties that the estimated amounts of materials or numbers provided herein are accurate or complete, or that they will constitute the amounts of materials required to be furnished under this Contract and, in addition, shall not be responsible for the conclusions to be drawn there from.

The pavement marking installation work included in this Contract will be performed at PANYNJ Facilities in New York and New Jersey.

	Mobile Long Lines	Long Line Removals	*Hand Work	Hand Work Removals
NJMT/NYMT	29%	21%	22%	17%
JFK	14%	21%	22%	17%
EWR	7%	21%	11%	17%
LGA	7%	9%	11%	12%
GWB	29%	9%	11%	12%
HT / LT	7%	9%	11%	12%
SIB	7%	9%	11%	12%

* See Part V, page 2, for specific definition of handwork.

**PART III – CONTRACT SPECIFIC TERMS AND CONDITIONS,
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PART III – CONTRACT SPECIFIC TERMS AND CONDITIONS

1. General Agreement

Subject to all of the terms and conditions of this Contract, the undersigned (hereinafter called the “Contractor”) hereby offers and agrees to provide all the necessary supervision, personnel, equipment, materials and all other things necessary to perform the Work required by this Contract as specified in Part II, and fully set forth in the Specifications, at the location(s) listed in Part II and fully set forth in the Specifications, and do all other things necessary or proper therefor or incidental thereto, all in strict accordance with the provisions of the Contract Documents and any future changes therein; and the Contractor further agrees to assume and perform all other duties and obligations imposed upon it by this Contract.

In addition, all things not expressly mentioned in the Specifications but involved in the carrying out of their intent and in the complete and proper execution of the matters referred to in and required by this Contract are required by the Specifications, and the Contractor shall perform the same as though they were specifically delineated, described and mentioned therein.

2. Duration

- a) The initial term of this Contract (hereinafter called the “Base Term”) shall commence on or about the date specified in Part II hereof, on the specific date set forth in the Port Authority’s written notice of bid acceptance (hereinafter called the “Commencement Date”), and unless otherwise terminated, revoked or extended in accordance with the provisions hereof, shall expire as specified in Part II hereof (hereinafter called the “Expiration Date”).
- b) If specified as applicable to this Contract and set forth in Part II hereof, the Port Authority shall have the right to extend this Contract for additional period(s) (hereinafter referred to as the “Option Period(s)”) following the Expiration Date, upon the same terms and conditions subject only to adjustments of charges, if applicable to this Contract, as may be hereinafter provided in the paragraph entitled “Price Adjustments”. If the Port Authority shall elect to exercise the Option(s) to extend this Contract, then, no later than thirty (30) days prior to the Expiration Date, the Port Authority shall send a notice that it is extending the Base Term of this Contract, and this Contract shall thereupon be extended for the applicable Option Period. If the Contract provides for more than one Option Period, the same procedure shall apply with regard to extending the term of this Contract for succeeding Option Periods.
- c) Unless specified as not applicable to this Contract in Part II hereof, the Port Authority shall have the absolute right to extend the Base Term for an additional period of up to one hundred and twenty (120) days subsequent to the Expiration Date of the Base Term, or the Expiration Date of the final exercised Option Period (hereinafter called the “Extension Period”), subject to the same terms and conditions as the previous contract period. The prices quoted by the Contractor for the previous contract period shall remain in effect during this Extension

Period without adjustment. If it so elects to extend this Contract, the Port Authority will advise the Contractor, in writing, that the term is so extended, and stipulate the length of the extended term, at least thirty (30) days prior to the expiration date of the previous contract period.

3. Payment

Subject to the provisions of this Contract, the Port Authority agrees to pay to the Contractor and the Contractor agrees to accept from the Port Authority as full and complete consideration for the performance of all its obligations under this Contract and as sole compensation for the Work performed by the Contractor hereunder, a compensation calculated from the actual quantities of services performed and the respective prices inserted by the Contractor in the Pricing Sheet(s), forming a part of this Contract, exclusive of compensation under the clause hereof entitled "Extra Work". The manner of submission of all bills for payment to the Contractor by the Port Authority for Services rendered under this Contract shall be subject to the approval of the Manager in all respects, including, but not limited to, format, breakdown of items presented and verifying records. All computations made by the Contractor and all billing and billing procedures shall be done in conformance with the following procedures:

- a) Payment shall be made in accordance with the prices for the applicable service (during the applicable Contract year) as they appear on the Pricing Sheet(s), as the same may be adjusted from time to time as specified herein, minus any deductions for services not performed and/or any liquidated damages to which the invoice may be subject and/or any adjustments as may be required pursuant to increases and decreases in areas or frequencies, if applicable. All Work must be completed within the time frames specified or as designated by the Manager. The Contractor is hereby advised that the bid quantities indicated in Part IV are for bid comparison and are not guaranteed. Actual Contract quantities may be significantly higher or lower than the bid quantity and may be zero.
- b) The Contractor shall submit to the Manager by the fifth (5th) day of each month following the month of commencement of this Contract and on or by the fifth (5th) day of each month thereafter (including the month following the termination, revocation or expiration of this Contract) a complete and correct invoice for the Work performed during the preceding month accompanied by such information as may be required by the Manager for verification. The invoice must show the Contractor's Federal Tax Identification Number. Payment will be made within thirty (30) days of Port Authority verification of the invoice. Invoices and bills may be sent to:

Port Authority Sign Shop
255 Port Street
Port Newark, NJ 07114

- c) No certificate, payment, acceptance of any Work or any other act or omission of any representative of the Port Authority shall operate to release the Contractor from any obligation under or upon this Contract, or to stop the Port Authority

from showing at any time that such certificate, payment, acceptance, act or omission was incorrect or to preclude the Port Authority from recovering any monies paid in excess of those lawfully due and any damage sustained by the Port Authority.

- d) In the event an audit of received invoices should indicate that the correct sum due the Contractor for the relevant billing period is less than the amount actually paid by the Port Authority, the Contractor shall pay to the Port Authority the difference promptly upon receipt of the Port Authority's statement thereof. The Port Authority may, however, in its discretion elect to deduct said sum or sums from any subsequent monthly payments payable to the Contractor hereunder.

"Final Payment", as the term is used throughout this Contract, shall mean the final payment made for services rendered in the last month of the Base Term or any extended term. However should this Contract be terminated for any reason prior to the last month of the Base Term or any extended term, then Final Payment shall be the payment made for services rendered in the month during which such termination becomes effective. The Contractor's acceptance of Final Payment shall act as a full and complete release to the Port Authority of all claims of and of all liability to the Contractor for all things done or furnished in connection with this Contract and for every act and neglect of the Port Authority and others relating to or arising out of this Contract, including claims arising out of breach of contract and claims based on claims of third persons. No payment, however, final or otherwise shall operate to release the Contractor from any obligations in connection with this Contract.

4. Price Adjustment

All Contract prices submitted by the Contractor and agreed to by The Port Authority, shall be applicable to the two (2) years of the Base Term. For the Option Period(s) that are applicable to this Contract and are exercised hereunder, (excluding the 120 day Extension Period as described in the paragraph entitled "Duration/Escalation" or "Duration" in Part III, hereof) The Port Authority shall adjust the compensation due to the Contractor utilizing the Consumer Price Index for all Urban Consumers; Series Id: CUURA101SA0L2; Not Seasonally Adjusted; New York-Northern New Jersey-Long Island, NY-NJ_CT-PA area; all items less shelter; 1982-1984=100, published by the Bureau of Labor Statistics of the United States Department of Labor (hereinafter called the "Price Index").

For the Option Period, the Price Index shall be determined for the months of August 2015 and August 2016. The compensation payable in year two (2) of the Base Term shall be multiplied by a fraction, the numerator of which is the Price Index for August 2016 and the denominator of which is the Price Index for August 2015. The resulting product shall be the compensation payable in the Option Period.

In the event of a change in the basis or the discontinuance of the publication by the United States Department of Labor of the Price Index, such other appropriate index shall be substituted as may be agreed to by the parties hereto as properly reflecting changes in value of the current United States money in a manner similar to that established in the said Price Index. In the event of the failure of the parties to so agree, the Port Authority may select and use such index, as it deems appropriate.

Notwithstanding the provisions of this section, in no event shall any adjustment hereunder be greater than three (3%) per annum.

If, after an adjustment referred to in this Section, the Index used for computing such adjustment shall be changed or adjusted, then the amounts payable to the Contractor for that period shall be recomputed. If such recomputation results in a smaller increase in the amount payable to such period, then after notification of the change or adjustment, the recomputed amounts shall be in effect and upon demand by the Port Authority, the Contractor shall refund to the Port Authority excess amounts theretofore paid by the Port Authority for such period.

5. Liquidated Damages

Not Applicable.

6. Insurance Procured by the Contractor

The Contractor shall take out, maintain, and pay the premiums on Commercial General Liability Insurance, including but not limited to premises-operations, products-completed operations, and independent contractors coverage, with contractual liability language covering the obligations assumed by the Contractor under this Contract and, if vehicles are to be used to carry out the performance of this Contract, then the Contractor shall also take out, maintain, and pay the premiums on Automobile Liability Insurance covering owned, non-owned, and hired autos in the following minimum limits:

Commercial General Liability Insurance - \$ 2 million combined single limit per occurrence for bodily injury and property damage liability.

Automobile Liability Insurance - \$ 2 million combined single limit per accident for bodily injury and property damage liability.

In addition, the liability policy (ies) shall name “The Port Authority of New York and New Jersey and its related entities, their commissioners, directors, officers, partners, employees, agents, and the City of New York as additional insured”, including but not limited to premise-operations, products-completed operations on the Commercial General Liability Policy. Moreover, the Commercial General Liability Policy shall not contain any provisions for exclusions from liability other than provisions for exclusion from liability forming part of the most up to date ISO form or its equivalent unendorsed Commercial General Liability Policy. The liability policy (ies) and certificate of insurance shall contain separation of insured condition and severability of interests clause for all policies so that coverage will respond as if separate policies were in force for each insured. An act or omission of one of the insureds shall not reduce or void coverage to the other insureds. Furthermore, the Contractor’s insurance shall be primary insurance as respects to the above additional insureds. Any insurance or self-insurance maintained by the above additional insureds shall not contribute to any loss or claim. These insurance requirements shall be in effect for the

duration of the Contract to include any warrantee/guarantee period.

The certificate of insurance and liability policy (ies) must contain the following endorsement for the above liability coverage's:

“The insurer(s) shall not, without obtaining the express advance written permission from the General Counsel of the Port Authority, raise any defense involving in any way the jurisdiction of the Tribunal over the person of the Port Authority, the immunity of the Port Authority, its Commissioners, officers, agents or employees, the governmental nature of the Port Authority, or the provisions of any statutes respecting suits against the Port Authority.”

The Contractor shall also take out, maintain, and pay premiums on Workers' Compensation Insurance in accordance with the requirements of law in the state(s) where work will take place, and Employer's Liability Insurance with limits of not less than \$1 million each accident.

Each policy above shall contain an endorsement that the policy may not be canceled, terminated, or modified without thirty (30) days' prior written notice to the Port Authority of NY and NJ, Att: Facility Contract Administrator, at the location where the work will take place and to the General Manager, Risk Management.

The Port Authority may at any time during the term of this agreement change or modify the limits and coverages of insurance. Should the modification or change results in an additional premium, The General Manager, Risk Management for the Port Authority may consider such cost as an out-of-pocket expense.

Within five (5) days after the award of this agreement or Contract and prior to the start of work, the Contractor must submit an original certificate of insurance, to the Port Authority of NY and NJ, Facility Contract Administrator, at the location where the work will take place. This certificate of insurance MUST show evidence of the above insurance policy (ies), including but not limited to the cancellation notice endorsement and stating the agreement/Contract number prior to the start of work. The General Manager, Risk Management must approve the certificate(s) of insurance before any work can begin. Upon request by the Port Authority, the Contractor shall furnish to the General Manager, Risk Management, a certified copy of each policy, including the premiums.

If at any time the above liability insurance should be canceled, terminated, or modified so that the insurance is not in effect as above required, then, if the Manager shall so direct, the Contractor shall suspend performance of the Contract at the premises. If the Contract is so suspended, no extension of time shall be due on account thereof. If the Contract is not suspended (whether or not because of omission of the Manager to order suspension), then the Authority may, at its option, obtain

insurance affording coverage equal to the above required, the cost of such insurance to be payable by the Contractor to the Port Authority.

Renewal certificates of insurance or policies shall be delivered to the Facility Contractor Administrator, Port Authority at least fifteen (15) days prior to the expiration date of each expiring policy. The General Manager, Risk Management must approve the renewal certificate(s) of insurance before work can resume on the facility. If at any time any of the certificates or policies shall become unsatisfactory to the Port Authority, the Contractor shall promptly obtain a new and satisfactory certificate and policy.

The requirements for insurance procured by the Contractor shall not in any way be construed as a limitation on the nature or extent of the contractual obligations assumed by the Contractor under this Contract. The insurance requirements are not a representation by the Authority as to the adequacy of the insurance to protect the Contractor against the obligations imposed on them by law or by this or any other Contract. CITS#4597N

7. Increase and Decrease in Areas or Frequencies

The Manager shall have the right, at any time and from time to time in their sole discretion, to increase or decrease the frequencies of all or any part of the services required hereunder and/or to add areas not described herein in the Specifications or remove areas or parts of areas which are hereunder so described. In the event the Manager decides to change any frequencies or areas such change shall be by written notice not less than five (5) work days, said changes to be effective upon the date specified in said notice.

In the event of an increase or decrease in areas or frequencies, the Contractor's compensation will be adjusted to reflect such change in areas or frequencies utilizing the applicable Unit Price for such services (for the applicable Contract year) as set forth on the Pricing Sheet(s).

Where no specific Unit Price has been quoted for the type of services to be increased or decreased, the Manager shall have the right to negotiate the compensation to reflect such change, whether an increase or decrease in areas or frequencies, which, in the opinion of the Manager, are necessary to complete the work, by multiplying the increased or decreased amount by the negotiated rate.

In the event of a decrease, the Contractor shall not be entitled to compensation for Work not performed.

No such change in areas or frequencies will be implemented which results in a total increase or decrease in compensation that is greater than 50% of the Total Estimated Contract Price for the Base Term or, if changes are to be implemented during an Option Period, 50% for that Option Period.

Any increases in frequencies or areas shall not constitute Extra Work and, as such, shall not be limited by the Extra Work provisions of this Contract.

8. Extra Work

The Contractor is required to provide separate materials, supplies, equipment and personnel for Extra Work when such is deemed necessary by the Manager. "Extra Work" as used herein shall be defined as work which differs from that expressly or impliedly required by the Specifications in their present form. Total Extra Work performed by the Contractor shall not exceed six percent (6%) of the Total Estimated Contract Price of this Contract for the entire Term of this Contract including extensions thereof, or six percent (6%) of the Total Estimated Contract Price of each Section if this Contract is awarded by separate Sections.

An increase in area or frequency does not constitute Extra Work, but shall be compensable based on the prices in the Pricing Sheet(s) and the paragraph herein titled "Increase or Decrease in Areas or Frequencies".

The Contractor is required to perform Extra Work pursuant to a written order of the Manager expressly recognizing such work as Extra Work. If Lump Sum or Unit Price compensation cannot be agreed upon by the parties in writing prior to the start of Work, the Contractor shall perform such Extra Work and the Contractor's compensation shall be increased by the sum of the following amounts and such amounts only: (1) the actual net cost, in money, of the labor, and material, required for such Extra Work; (2) ten percent (10%) of the amount under (1) above; (3) such rental as the Manager deems reasonable for plant and equipment (other than small tools) required for such Extra Work; (4) if the Extra Work is performed by a subcontractor, an additional five percent (5%) of the sum of the amounts under (1) through (3) above.

As used in this numbered clause (and in this clause only):

"Labor" means laborers, mechanics, and other employees below the rank of supervisor, directly employed at the Site of the Work subject to the Manager or their designee's authority to determine what employees of any category are "required for Extra Work" and as to the portion of their time allotted to Extra Work; and "cost of labor" means the wages actually paid to and received by such employees plus a proper proportion of (a) vacation allowances and union dues and assessments which the employer actually pays pursuant to contractual obligation upon the basis of such wages, and (b) taxes actually paid by the employer pursuant to law upon the basis of such wages and workers' compensation premiums paid pursuant to law.

"Employees" as used above means only the employees of one employer.

"Net Cost" shall be the Contractor's actual cost after deducting all permitted cash and trade discounts, rebates, allowances, credits, sales taxes, commissions, and refunds (whether or not any or all of the same shall have been taken by the Contractor) of all parts and materials purchased by the Contractor solely for the use in performing its obligation hereunder provided, where such purchase has received the prior written approval of the Manager as required herein. The Contractor shall promptly furnish to the Manager such bills of sale and other instruments as the Manager may require, executed, acknowledged and delivered, assuring to the Manager title to such materials, supplies, equipment, parts, and tools free of encumbrances.

“Materials” means temporary and consumable materials as well as permanent materials; and “cost of materials” means the price (including taxes actually paid by the Contractor pursuant to law upon the basis of such materials) for which such materials are sold for cash by the manufacturers or producers thereof, or by regular dealers therein, whether or not such materials are purchased directly from the manufacturer, producer or dealer (or if the Contractor is the manufacturer or producer thereof, the reasonable cost to the Contractor of the manufacture and production), plus the reasonable cost of delivering such materials to the Site of the Work in the event that the price paid to the manufacturer, producer or dealer does not include delivery and in case of temporary materials, less their salvage value, if any.

The Manager shall have the authority to decide all questions in connection with the Extra Work. The exercise by the Manager of the powers and authorities vested in him/her by this section shall be binding and final upon the Port Authority and the Contractor.

The Contractor shall submit all reports, records and receipts as are requested by the Manager so as to enable him/her to ascertain the time expended in the performance of the Extra Work, the quantity of labor and materials used therein and the cost of said labor and materials to the Contractor.

The provisions of this Contract relating generally to Work and its performance shall apply without exception to any Extra Work required and to the performance thereof. Moreover, the provisions of the Specifications relating generally to the Work and its performance shall also apply to any Extra Work required and to the performance thereof, except to the extent that a written order in connection with any particular item of Extra Work may expressly provide otherwise.

If the Contractor deems work to be Extra Work, the Contractor shall give written notice to the Manager within twenty-four (24) hours of performing the work that it so considers as Extra Work, and failure of the Contractor to provide said notice shall be a waiver of any claim to an increase in compensation for such work and a conclusive and binding determination that it is not Extra Work.

The Contractor shall supply the amount of materials, supplies, equipment and personnel required by the Manager within two (2) business days following the receipt of written or verbal notice from the Manager, or in the case of an emergency as determined by the Manager, within twenty four (24) hours following the receipt by the Contractor of the Manager’s written or oral notification. Where oral notification is provided hereunder, the Manager shall thereafter confirm the same in writing.

All Extra Work shall be billed to the Port Authority on a separate invoice on a monthly basis.

**PART IV – SIGNATURE SHEET, NAME AND RESIDENCE OF PRINCIPALS SHEET
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PART IV – SIGNATURE SHEET, NAME AND RESIDENCE OF PRINCIPALS SHEET AND PRICING SHEET(S)

1. SIGNATURE SHEET

OFFER: The undersigned offers and agrees to furnish to the Port Authority of New York and New Jersey the services and/or materials in compliance with all terms, conditions, specifications and addenda of the Contract. Signature also certifies understanding and compliance with the certification requirements of the standard terms and conditions as contained in the Standard Contract Terms and Conditions. This offer shall be irrevocable for 120 days after the date on which the Port Authority opens this bid.

ONLY THE COMPANY NAMED AS THE BIDDING ENTITY BELOW WILL RECEIVE PAYMENT. THIS MUST BE THE SAME NAMED COMPANY AS INDICATED ON THE COVER SHEET

Bidding Entity_____

Bidder's Address_____

City, State, Zip_____

Telephone No._____ FAX_____

Email_____ EIN# _____

SIGNATURE_____ Date_____

Print Name and Title_____

ACKNOWLEDGEMENT:

STATE OF: _____

COUNTY OF: _____

On this ___day of_____, 20_____, personally came before me, _____, who duly sworn by me, did depose that (s)he has knowledge of the matters herein stated, that they are in all respects true and that (s)he has been authorized to execute the foregoing offer and statement of irrevocability on behalf of said corporation, partnership or firm.

Notary Public

NOTE: If a joint venture is bidding, duplicate this Signature Sheet and have each party to the joint venture sign separately and affix to the back of this Signature Sheet.

Bidder attention is called to the certification requirements contained in the Standard Contract Terms and Conditions, Part III. Indicate below if a signed, explanatory statement in connection with this section is attached hereto.

If certified by the Port Authority as an SBE or MWBE: _____ (indicate which one and date).

2. NAME AND RESIDENCE OF PRINCIPALS SHEET

Names and Residence of Principals of Bidder. If general or limited partner, or individual, so indicate.

NAME	TITLE	ADDRESS OF RESIDENCE (Do not give business address)
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3. PRICING SHEET(S)

Entry of Prices

- a. The prices quoted shall be written in figures, in ink, preferably in black ink, in the spaces provided on the Pricing Sheet(s) attached hereto and made a part hereof.
- b. All Bidders are asked to ensure that all charges quoted for similar operations in the Contract are consistent.
- c. Prices must be submitted for each Item required on the Pricing Sheet(s). Bidders are advised that the Items on the Pricing Sheet(s) correspond to the required services set forth in the Specifications hereunder.
- d. Bidders must insert all figures as required and verify all computations for accuracy. The Port Authority in its sole judgment reserves the right to: (1) reject Bids without checking them for mathematical errors or omissions, (2) reject Bids that contain or appear to contain errors or omissions, and (3) supply corrections to Bids that contain or appear to contain mathematical errors and omissions, and in this case the Port Authority reserves the right to recompute the Estimated Contract Price based upon the Unit Prices inserted by the Bidder, which amount shall then govern in all cases.
- e. In the event that a Bidder quotes an amount in the Estimated column but omits to quote a Unit Price for that amount in the space provided, the Port Authority reserves the right to compute and insert the appropriate Unit Price.
- f. The Total Estimated Contract Price is solely for the purpose of facilitating the comparisons of Bids. Compensation shall be in accordance with the section of this Contract entitled "Payment".
- g. The Total Estimated Contract Price shall be obtained by adding the Total Estimated Contract Price for Year One to the Total Estimated Contract Price for Year Two.

YEAR ONE PRICING

WORK TASK	Estimated Quantity		Unit Price (Linear Foot by 6" wide)		Estimated Year One Contract Price
Mobile Long Line Application	-----	-	-----	-	-----
02581C Wet Reflective Thermoplastic Pavt. Markings	130,000	x	\$	=	\$
02581C Wet Reflective Thermoplastic Re-Capping	35,000	x	\$	=	\$
02580 Thermoplastic Reflectorized Pavt. Markings	5,000	x	\$	=	\$
02588C Wet Reflective High Build Paint Pavt. Markings	2,000	x	\$	=	\$
02588C Standard Paint Pavement Markings	2,000	x	\$	=	\$
Hand Work Line Application	-----	-	-----	-	-----
02581C Wet Reflective Thermoplastic Pavt. Markings	10,000	x	\$	=	\$
02580 Thermoplastic Reflectorized Pavement Markings	3,500	x	\$	=	\$
02588C Wet Reflective High Build Paint Pavt. Markings	1,500	x	\$	=	\$
02588C Standard Paint Pavement Markings	1,500	x	\$	=	\$
02583C Preformed Wet Reflective Pavt. Marking Tape	4,000	x	\$	=	\$
02584C Preformed Removable Wet Reflective Tape	4,000	x	\$	=	\$
Removal of Pavement Markings: Mobile or Hand Work Removal per Specifications	10,000	x	\$	=	\$
WORK TASK	Estimated Quantity		Unit Price (Square Foot)		Estimated Year One Contract Price
Preformed Thermoplastic Application	-----	-	-----	-	-----
02585C Preformed Thermoplastic Letters & Symbols	1,000	x	\$	=	\$
02585C Preformed Thermoplastic Lines	1,500	x	\$	=	\$
Letters and Symbol Application:	-----	-	-----	-	-----
02581C Wet Reflective Thermoplastic Pavt. Markings	1,000	x	\$	=	\$
02580 Thermoplastic Reflectorized Pavt. Markings	1,000	x	\$	=	\$
02583C Preformed Wet Reflective Pavt. Marking Tape	1,000	x	\$	=	\$
02584C Preformed Removable Wet Reflective Tape	1,000	x	\$	=	\$
Removal of Pavement Markings: Removal of Letters or Symbols per Specifications	1,500	x	\$	=	\$
Snowplowable Marker Installation	Estimated Quantity		Unit Price (Each)		Estimated Year One Contract Price
02587C Pavement Marker: One Way or Two Way	100				
02587C Replace One Way or Two Way Retroreflector	100				
02587C Remove Snowplowable Marker	100				
CONTINGENCY WORK:	\$ 40,000		Fixed Lump Sum Year One		\$ 40,000

Total Estimated Year One Price \$ _____

YEAR TWO PRICING

WORK TASK	Estimated Quantity		Unit Price (Linear Foot by 6" wide)		Estimated Year Two Contract Price
Mobile Long Line Application	-----	-	-----	-	-----
02581C Wet Reflective Thermoplastic Pavt. Markings	130,000	x	\$	=	\$
02581C Wet Reflective Thermoplastic Re-Capping	35,000	x	\$	=	\$
02580 Thermoplastic Reflectorized Pavt. Markings	5,000	x	\$	=	\$
02588C Wet Reflective High Build Paint Pavt. Markings	2,000	x	\$	=	\$
02588C Standard Paint Pavement Markings	2,000	x	\$	=	\$
Hand Work Line Application	-----	-	-----	-	-----
02581C Wet Reflective Thermoplastic Pavt. Markings	10,000	x	\$	=	\$
02580 Thermoplastic Reflectorized Pavement Markings	3,000	x	\$	=	\$
02588C Wet Reflective High Build Paint Pavt. Markings	1,500	x	\$	=	\$
02588C Standard Paint Pavement Markings	1,500	x	\$	=	\$
02583C Preformed Wet Reflective Pavt. Marking Tape	4,000	x	\$	=	\$
02584C Preformed Removable Wet Reflective Tape	4,000	x	\$	=	\$
Removal of Pavement Markings: Mobile or Hand Work Removal per Specifications	10,000	x	\$	=	\$
WORK TASK	Estimated Quantity		Unit Price (Square Foot)		Estimated Year Two Contract Price
Preformed Thermoplastic Application	-----	-	-----	-	-----
02585C Preformed Thermoplastic Letters & Symbols	1,000	x	\$	=	\$
02585C Preformed Thermoplastic Lines	1,500	x	\$	=	\$
Letters and Symbol Application:	-----	-	-----	-	-----
02581C Wet Reflective Thermoplastic Pavt. Markings	1,000	x	\$	=	\$
02580 Thermoplastic Reflectorized Pavt. Markings	1,000	x	\$	=	\$
02583C Preformed Wet Reflective Pavt. Marking Tape	1,000	x	\$	=	\$
02584C Preformed Removable Wet Reflective Tape	1,000	x	\$	=	\$
Removal of Pavement Markings: Removal of Letters or Symbols per Specifications	1,500	x	\$	=	\$
Snowplowable Marker Installation	Estimated Quantity		Unit Price (Each)		Estimated Year Two Contract Price
02587C Pavement Marker: One Way or Two Way	100				
02587C Replace One Way or Two Way Retroreflector	100				
02587C Remove Snowplowable Marker	100				
CONTINGENCY WORK:	\$ 40,000		Fixed Lump Sum Year Two		\$ 40,000

Total Estimated Year Two Price \$ _____

PRICING SUMMARY

A) TOTAL ESTIMATED CONTRACT PRICE – YEAR ONE

\$ _____

B) TOTAL ESTIMATED CONTRACT PRICE – YEAR TWO

\$ _____

C) TOTAL ESTIMATED TWO (2) YEAR CONTRACT PRICE =

**\$ _____
(Sum of Items A + B above)**

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PART V – SPECIFICATIONS

1. Specific Definitions

To avoid undue repetition, the following terms, as used in this Contract, shall be construed as follows:

“Facility” shall mean the following Port Authority locations, unless otherwise specified:

NJMT	Port Newark Marine Terminals NJ Port Elizabeth Marine Terminals NJ Auto Marine Terminal NJ
NYMT	Brooklyn Marine Terminal NY Red Hook Container Terminal NY Howland Hook Marine Terminal NY
JFK	John F. Kennedy International Airport NY
LGA	LaGuardia Airport NY
EWR	Newark Liberty International Airport NJ
GWB	George Washington Bridge
HT	Holland Tunnel
LT	Lincoln Tunnel
SIB	Staten Island Bridges: Bayonne Bridge (BB) Outer Bridge Crossing (OBX) Goethals Bridge (GB)

Note: The Port Authority reserves the right to unilaterally add other Facilities to and delete Facilities from this Contract.

“Other Facilities” shall mean any other Port Authority Facility at which the Sign Shop Supervisor requires the Contractor to perform the services of this Contract. The Sign Shop Supervisor will direct the Contractor by oral or written directions to specific locations.

“Attenuator Truck” shall mean a truck equipped with a rear-mounted safety appliance that dissipates the energy of a rear-end collision.

“Sign Shop” shall mean the Port Authority of NY & NJ Facility located at Bldg 255 Port Street, Port Newark, NJ 07114.

“Hand Work” shall mean the installation of reflective markings using portable application equipment at such areas as crosswalks and in such patterns as stop bars, legends, arrows and short lengths of lane lines and channelization.

“Sign Service Request form” (SSR form) shall mean the Port Authority form prepared by the Traffic Engineering Department with specific information for the installation of pavement markings at Port Authority Facilities. This form will include dimensions and prints of work required.

“Traffic Engineering” shall mean the Port Authority of NY & NJ division that directs traffic standards for all Port Authority Facilities.

“Manager” shall mean the Sign Shop Supervisor, or a designated representative that will provide all information for the installation and removal of markings at Port Authority Facilities and will be the single point of contact for the Contractor.

“Contingency Work” shall be defined as work that is not covered by the unit price items included in this Contract. When the Manager determines the need for “Contingency Work” pavement marking services to address facility issues, the Contractor will be directed to perform these services on an agreed price basis.

“Engineer” references included in the technical specifications shall mean the Sign Shop Supervisor.

“Contract Drawings” shall mean pavement marking layout drawings provided by the Manager after the award of the Contract on an “as needed” basis.

2. Work Required by the Specifications

These specifications relate generally to the application of reflective traffic markings, and removal of old pavement markings at various Port Authority of New York and New Jersey facilities as requested by the Sign Shop Supervisor via written SSR forms. The Contractor shall furnish all labor, supervision, equipment, materials, maintenance of traffic operations and supplies and do all other things necessary, proper or incidental thereto, all in strict accordance with the provisions of the Contract documents and any future changes therein, and the Contractor agrees to assume and perform all other duties and obligations expressly or by implication required by this Contract.

The quantities of materials set forth in the Pricing Sheet are estimates which may not correspond to the quantities that may actually be required during the term of this Contract. The Port Authority makes no representation or guarantee as to what its actual requirements will be.

The Port Authority shall have the absolute right to cancel a SSR at any time after the work has been ordered up to the start of field operations, at no additional cost to the Port Authority. The Port Authority agrees to pay the Contractor and the Contractor agrees to accept from the Port Authority in full consideration for the performance by the Contractor of its duties and obligations under this Contract and the whole thereof, a compensation based on (1) the work actually performed and (2) units of measurement and prices per unit as set forth in the “Pricing Sheet(s)” in Part IV of the Contract. All Work under this Contract shall be performed pursuant to SSRs issued by Traffic Engineering and provided to the Contractor by the Sign Shop Supervisor.

3. Scope of Work

The scope of work includes (1) the installation and removal of thermoplastic, pre-formed, epoxy, paint and snowplowable reflectorized pavement markings (paid on a unit cost basis as specified herein) and (2) unspecified contingency work.

4. Application and Removal of Reflectorized Pavement Markings

A. General Application

The following requirements supplement the technical specifications listed below in the section of these Specifications entitled "Technical Specifications".

The Contractor shall have the capability to provide multiple crews at multiple Facilities simultaneously, as directed.

Contractor will receive directions via SSR forms provided by the Sign Shop Supervisor. Perform pavement marking layout work according to the information provided on the SSR form. The Contractor will be permitted to remove and apply material at the same time.

Two (2) general application methods shall be used for this work. The first is mobile long line stripping. Long line stripping shall be a moving operation. Apply primer in accordance with the material manufacturer's recommendations.

The second general application method is hand work. Hand work includes the installation of reflective pavement markings using portable application equipment for such areas as crosswalks, stop bars, legends, arrows, short lengths of lane lines and channelization and other areas as designated by the Sign Shop Supervisor. Note: Hand work crews shall include a minimum crew of four, including one Supervisor.

The Contractor shall be required to maintain and use an attenuator truck for the safety of marking installers.

The Contractor shall be required to place traffic cones for the maintenance and protection of traffic. Costs for all required traffic control, including but not limited to cones, flaggers, signs and attenuator trucks to be used in conjunction with the services described herein shall be included in the unit price shown on the Pricing Sheets. No separate payment will be made for maintenance of traffic services.

Some areas may require the use of primer for concrete areas per the appropriate material specification and manufacturer's recommendations. Additional instructions on the use of primer may be provided to the Contractor via a SSR form.

1. Surface Cleaning and Preparation of Pavement

- a. Clean the pavement surfaces to be marked immediately prior to priming and marking application. Surface cleaning and preparation shall be performed only in the pavement marking installation area.

- b. At the time of the application of the pavement marking material, all pavement surfaces shall be dry, free of oil, dirt, dust, grease and similar foreign materials and the primer shall be tack free.
2. Application of Pavement Marking Materials
- a. Apply pavement markings at the locations specified and in accordance with the patterns and dimensions shown on the Contract Drawings provided via SSR.
 - b. Do not start any pavement marking work without first checking in with the Sign Shop Supervisor.
 - c. When pavement markings are applied under traffic conditions, provide all necessary qualified personnel, flags, markers, signs etc., to maintain and protect traffic, and to protect marking operations and new markings until thoroughly set.
 - d. Apply pavement markings in the general direction of traffic.
 - e. Remove, to the satisfaction of the Sign Shop Supervisor, all tracking marks, spilled materials and materials applied in unauthorized areas.
 - f. When necessary, perform marking layout work according to Contract Drawings provided via SSR form.
 - g. Place reflective pavement markings upon clean and dry surfaces. Verify that, at the time of installation, the pavement surface and ambient temperatures are within the range indicated in the technical specifications.
 - h. Provide a mobile roadway sweeper to pick up all removed materials (grindings). Empty debris picked up by the sweeper into a Port Authority provided dumpster for disposal by the Port Authority.

5. Maintenance of Traffic

Furnish, place and maintain all required Maintenance of Traffic (MOT) materials and equipment in accordance with this Contract and as directed by the Sign Shop Supervisor including all personnel, cones, signs, arrow boards, back-up vehicles, attenuator trucks and all other materials required to maintain traffic in accordance with Port Authority requirements and as directed by the Sign Shop Supervisor.

Strictly adhere to the provisions of Port Authority of NY and NJ O & M Standard 20 for typical roadway work area protection procedures (see attached Exhibit A).

For work areas that require supplemental or site-specific Maintenance of Traffic (MOT) plans, these will be provided by SSR form or when requested by the Contractor. The Contractor shall at all times conduct his operations to ensure the safety and convenience of all travelers, of abutting property owners and of its own employees.

Include all costs for the maintenance of traffic operations that are required in this Contract in the unit prices for the various items included in this Contract. No separate payment will be made for maintenance of traffic operations.

6. Application Specifications

- A. All pavement surfaces (new and existing) to be marked shall be primed, as required, in accordance with the recommendations of the material manufacturer and the technical specifications included in this Contract.
- B. Furnish and install all paint, thermoplastic, epoxy, pre-formed, hot tape and snowplowable markers in strict accordance with the manufacturer's recommendations and the technical specifications included in this Contract.
- C. The base thermoplastic furnished and installed under this Contract shall be manufactured in granular or block form and shall be alkaloid thermoplastic material.

D. General Removal of Pavement Markings

Use a mechanical grinder to remove pavement markings. For long line work this grinding equipment must be a mobile grinding unit capable of removing longitudinal pavement markings in a moving operation. Use portable removal grinding equipment to remove small hand work areas. Alternate methods of removal with high-pressure water removal equipment (water blast) or dry sandblasting may be used with the Sign Shop Supervisor's approval. If water blast is used, subsequent installation of new thermoplastic markings must be completed during the same work tour and must comply with all applicable specifications.

Conduct grinding, water-blasting, dry sandblasting and other operations in such a manner that the finished pavement surface is not damaged or left in a pattern that will mislead or misdirect the motorist. When these operations are completed the pavement surface shall first be power broomed and then blown off with compressed air to remove residue and debris resulting from the cleaning work. All such debris that remains on the roadway, including broken parts from cleaning equipment, shall be removed and disposed of in a manner satisfactory to the Sign Shop Supervisor.

Conduct removal and cleaning work in such a manner as to minimize airborne dust and similar debris and to avoid hazards to motor vehicle operation and nuisance to property owners. Care shall be taken on bituminous and portland cement concrete surfaces when performing removal and cleaning work to prevent damage to transverse and longitudinal joint sealers.

7. Equipment

A. General:

Long line pavement marking installation work with back-up attenuator truck equipment is required for all moving operations as well as small hand work. Coning and back-up attenuator equipment may also be required for some small hand work. This will be determined by the Sign Shop Supervisor.

1. All vehicles used in the performance of pavement marking installation work at Port Authority Facilities shall be equipped with approved safety flashers,

signs and all safety equipment required in accordance with the Contract provisions and as ordered by the Sign Shop Supervisor.

2. Only equipment approved by the Sign Shop Supervisor prior to the start of application may be used during the performance of this Contract.
3. Unless otherwise approved by the Sign Shop Supervisor all longitudinal pavement marking lines shall be striped using mobile applicator equipment. Longitudinal pavement marking lines include but are not limited to: broken lines (skip line), edge lines, barrier lines and solid lines as defined by the SSR form.

Portable applicator equipment will be acceptable for placing all other markings; and for longitudinal marking where use of mobile applicator equipment is impractical, as approved by the Sign Shop Supervisor.

4. Apply all marking materials to pavement surfaces in accordance with manufacturer's recommendations and the technical specifications included in this Contract.

B. Mobile Applicator Equipment

The mobile applicator(s) shall be defined as truck chassis mounted, self-contained marking machines that are capable of applying the pavement marking materials included in this Contract. Each truck must be a registered vehicle with warning lighting mounted on the front and rear of the truck. Operators of the mobile equipment must be on the truck chassis or in the truck cab.

1. Vehicle heights cannot be greater than 12'6" in order to work at the Holland Tunnel.
2. The mobile applicator shall be equipped with an electronic and programmable line pattern control system or with a mechanical control system so as to be able to apply skip or solid lines in any sequence.

C. Portable Applicator Equipment

1. The portable applicator shall be defined as hand operated equipment specifically designed for placing pavement marking materials at crosswalks and capable of placing stop bars, legends, arrows and short lengths of lane lines and channelization.

D. Pavement Marking Removal Equipment

1. There shall be two (2) types of removal equipment: (1) mobile truck mounted mechanical grinder and (2) portable walk-behind grinders for handwork.
 - a. The mobile truck mounted mechanical grinder removal equipment must have warning lights mounted to the front and rear of the truck.
 - b. Both the mobile truck mounted mechanical grinder and portable walk behind grinders for handwork equipment shall keep dust to a minimum.
2. The Contractor shall, at no additional cost to the Authority, be prepared to supply and use a mobile sweeper for some long line removal.

8. Work Tours and Cancellation of Work

- A. Work tours will be scheduled 7 (seven) days a week, night or day tours at the discretion of the Sign Shop Supervisor, depending on the Facility's need and the ability to schedule lane closures. Peak hour restrictions will apply and no work will be scheduled on Holidays.
- B. The Port Authority shall have the absolute right to cancel a job at any time after the work has been ordered, up to the start of field operations, at no additional cost to the Port Authority.

9. End of Working Tour Procedure

At the conclusion of the working tour, submit a receipt of completed work to the Sign Shop Supervisor. The receipt shall include but not be limited to: the Facility where work was performed, the amount of material used per the specific material pay item (Linear Foot, Square Foot or Each) and the color of material used. The receipt shall also specify the company's name, address, telephone and fax number and the date the work was completed.

10. Uniforms

The Contractor's employees shall be outfitted with garments that display the company name/logo and shall present a neat, clean and orderly appearance at all times. All employees shall wear approved safety vests at all times when working at Port Authority Facilities.

11. Security Clearance

The Contractor's employees will be subject to Port Authority security requirements. All employees shall be required to carry a valid State issued motor vehicle license or a non-driver State issued ID at all times. Employees working at any Port Authority Facility that requires a Facility ID shall obtain and carry a Port Authority issued identification card. Employees without proper identification will not be permitted to work.

The Contractor may also be required to comply with the security requirements included in Part II of this Contract entitled "Contractor Staff Background Screening".

12. Communications

The Contractor shall provide the Port Authority with a landline phone number as well as cellular phone numbers for all crews that operate at Port Authority Facilities.

13. Basis of Payment

Payment for completed SSR will be made on a unit cost basis as indicated below and in accordance with the technical specifications referenced in this Contract. Contract prices for all Contract items shall include, but not be limited to, costs for furnishing all labor, materials and equipment necessary to satisfactorily complete the work. All costs for maintaining and protecting traffic during all Contract operations shall be included in the unit price for the various Contract items; no separate payment will be made.

MOBILE LONG LINE AND HAND WORK LINE APPLICATION

Payment for installation of the various pavement-marking materials included in this Contract will be accordance with the below noted criteria and as indicated on the pricing sheets.

Line Work: will be measured and paid in accordance with the *LINEAR FOOT BY 6" WIDE* unit price for mobile or hand work application materials actually installed on the pavement; no payment will be made for the open spaces in between the lane stripes.

Stop lines, Cross Walks, Straight Lines and Channelization: will be measured and paid in accordance with the *LINEAR FOOT BY 6" WIDE* unit price, factored to reflect the actual line width that is installed (ie: Payment for a twelve inch wide line will be two times the base linear foot by six inch wide price).

Rumble strips: will be measured and paid in accordance with the *LINEAR FOOT BY SIX INCH WIDE* unit price times the number of layers installed.

MOBILE OR HAND WORK REMOVAL PER SPECIFICATIONS

Payment for the removal of long line or hand work markings included in this Contract will be in accordance with the *LINEAR FOOT BY 6" WIDE* unit price for markings that are removed per the specifications.

PERFORMED THERMOPLASTIC APPLICATION

Payment for installation of Preformed Thermoplastic Markings (symbols, lines, legends) will be in accordance with the *SQUARE FOOT* unit price of materials that are installed. Calculation of the installed markings will be based upon the outside perimeter of the individual markings that are installed, without deduction for void areas.

LETTERS AND SYMBOL APPLICATION

Letters: will be measured and paid in accordance with the *SQUARE FOOT* unit price of materials that are installed. Calculation of the installed markings will be based upon the outside perimeter of the individual letters that are installed, without deduction for void areas (ie: an 8' tall by 20" wide letter "Y" will be paid as 13.3 SF per PA Standard Detail TD50.04*).

Symbols: will be measured and paid in accordance with the *SQUARE FOOT* unit price of materials that are installed. Calculation of the installed markings will be based upon the outside perimeter of the individual symbols that are installed, without deduction for void areas (ie: an 8'-3" by 6'-7" left turn arrow will be paid as 54.3 SF per PA Standard Detail TD50.03*).

* <http://www.panynj.gov/business-opportunities/pdf/discipline-guidelines/traffic.pdf>

REMOVAL OF LETTERS OR SYMBOLS PER SPECIFICATIONS

Payment for the removal of letters and symbol markings included in this Contract will be in accordance with the *SQUARE FOOT* unit price for markings that are removed per the specifications.

SNOWPLOWABLE MARKER INSTALLATION

Snowplowable Pavement Markers: will be paid in accordance with the EACH (per piece) unit price for markings that are installed or removed per specifications.

Replacement Retroreflectors for Snowplowable Markers: will be paid in accordance with the EACH (per piece) unit price for markings that are installed or removed per specifications.

CONTINGENCY WORK

Payment for approved contingency work will be paid on an agreed price basis.

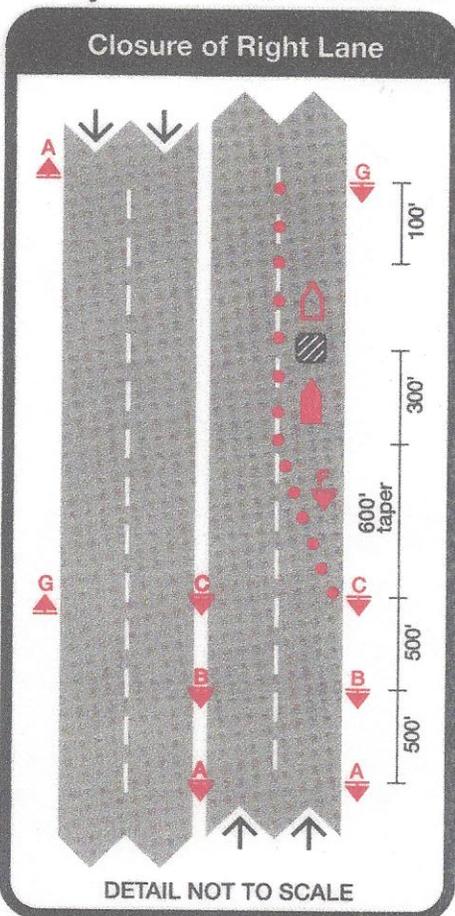
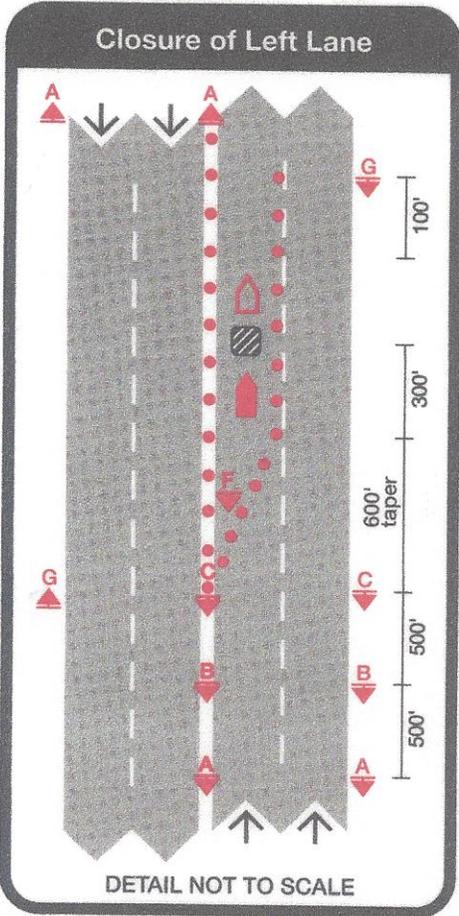
14. Technical Specifications

The following technical specifications shall apply to work performed under this Contract:

Section	Description
02580	Thermoplastic Reflectorized Pavement Markings
02581C	Wet Reflective Thermoplastic Pavement Markings
02583C	Preformed Wet Reflective Pavement Marking Tape
02584C	Preformed Removable Wet Reflective Pavement Marking Tape
02585C	Preformed Thermoplastic Pavement Markings
02588C	Traffic Paint Pavement Markings Standard and Wet Reflective High Build Paint Applications
02587C	Raised Reflectorized Snowplowable Pavement Markers

The contractor’s attention is directed to the submittal requirements in Appendix “A” of the above noted technical specifications.

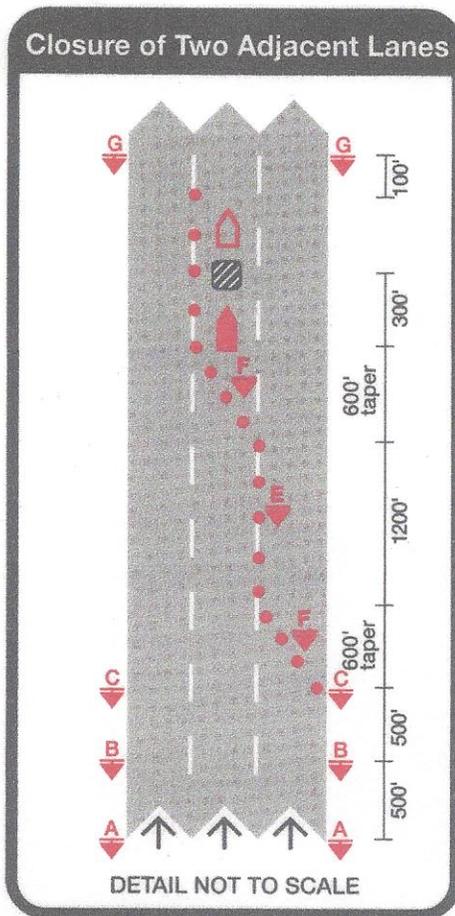
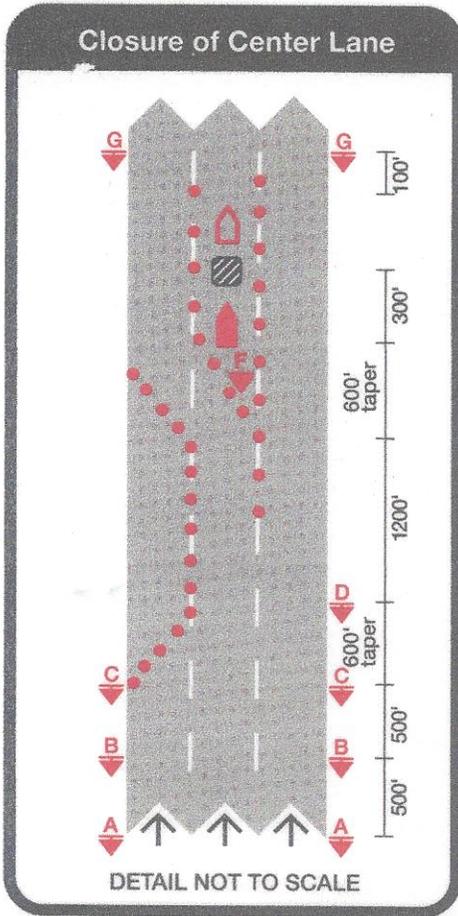
Short Duration Typical Roadway Work Area Protection



Legend see other side for notes

A	High intensity flashing lights 48" x 48" sign	D	48" x 48" sign	G	4' x 2' sign		work area
B	LEFT, CENTER or RIGHT 48" x 48" sign	E*	4' x 2' sign		50'-100' in advance of work area		work vehicle with flashing warning lights (impact attenuator is not required on this vehicle)
C	LEFT or RIGHT 48" x 48" sign	F*	flashing arrow 8' x 4' sign (set on low at intensity night) * Arrow points to open lane(s).		28" high orange traffic cones at 25' intervals		

Short Duration Typical Roadway Work Area Protection



Notes

see other side for legend

1. Place Sign A, B and C on Both Sides of Roadway Where Possible.
2. All Fixed Signs Are Black on Reflective Florescent Orange.
3. Where Speeds Are Less than 30MPH., 500' Spacing May be Reduced to 200', and 600' Taper Reduced to 200'.
4. Median Cone Line, Reverse Direction Signs not Required on Roadways Divided by Raised Barrier or Medians Over 12' Wide.
5. Gross Back-Up Vehicle Weight Between 11,000 lbs. and 26,000 lbs.
6. For Long Duration or Special Conditions, Contact CHIEF TRAFFIC ENGINEER'S Office for Special Traffic Control Plans.
7. A Second Vehicle in Front of Work Area is Required As Shown; Attenuator not Required on This Vehicle.

DIVISION 2

SECTION 02580

**THERMOPLASTIC REFLECTORIZED
PAVEMENT MARKINGS**

PART 1. GENERAL

1.1 SUMMARY

This Section specifies requirements for thermoplastic reflectORIZED pavement markings.

1.2 REFERENCES

The following is a listing of the publications referenced in this Section:

American Association of State Highway and Transportation Officials (AASHTO)

- AASHTO M 247 Specification for Glass Beads Used in Pavement Markings.
- AASHTO M 249 Specification for White and Yellow Reflective Thermoplastic Striping Material (Solid Form).
- AASHTO T 250 Standard Method of Test for Thermoplastic Traffic Line Material.

American Society for Testing and Materials (ASTM)

- ASTM D 36 Test Method for Softening Point of Bitumen (Ring-and-Ball Apparatus).
- ASTM D 1155 Test Method for Roundness of Glass Spheres.
- ASTM D 1214 Test Method for Sieve Analysis of Glass Spheres.

Federal Highway Administration (FHWA)

- MUTCD Manual on Uniform Traffic Control Devices.

Federal Standards

- FED-STD-595C Colors Used in Government Procurement.

1.3 QUALITY ASSURANCE

- A. The quality and workmanship of the completed marking installation shall conform to 3.02 C.4.
- B. Warranty

Arrange for the completed marking installation to be warranted to the Authority, from the date of issuance of the Certificate of Final Completion, against peeling, chipping, flaking, delamination and showing for a period of one year. The warranty shall run to the Authority's benefit and shall grant the Authority a direct right of action against the manufacturer.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Use thermoplastic material that has been manufactured in block form and packaged in suitable corrugated containers to which it will not adhere during shipment or storage. Each container shall weigh approximately 50 pounds and shall consist of blocks approximately 12 inches x 36 inches x 2 inch in size. Each container shall be sealed at the point of manufacture and plainly marked with the color, basic resin type (either hydrocarbon or alkaloid), manufacturer's name, batch number and date of manufacture, and a statement stating the contents meet the requirements of this Section. Each batch manufactured shall have its own separate number. The label shall warn the user that the material shall not be heated in excess of 440 degrees F gauge.
- B. Arrange for the reflective glass spheres for drop-on application to be shipped in strong moisture resistant bags each containing approximately 50 lbs of reflective glass spheres. Each bag shall be marked with the name and address of the manufacturer, the name and weight of the material, a statement stating the contents meet the requirements of this Section, date of manufacture and batch number.
- C. Arrange for primer to be shipped in pails, drums or other strong containers. Each container shall be plainly marked with the brand name of the product, the name and address of the manufacturer, the date of manufacture, the quantity of material, the date of expiration or shelf life and appropriate hazard warnings. Primers shall be shipped to the construction site with instructions for use affixed to each container.

1.5 SUBMITTALS

See Appendix "A" for submittal requirements.

PART 2. PRODUCTS

2.1 MATERIALS

- A. White and yellow reflectorized thermoplastic shall conform to AASHTO M 249.

- 1. Composition Requirements

The thermoplastic material composition shall be specifically formulated for application at temperatures greater than 400 degrees F true (measured with high precision laboratory grade equipment) and shall show no significant breakdown or deterioration at a true temperature of 450 degrees F.

- a. The binder component shall be formulated as hydrocarbon resin or formulated as alkaloid base product, unless otherwise shown on the Contract Drawings. The pigment, beads and filler shall be uniformly dispersed in the binder resin.

- b. The thermoplastic material shall be free from all skins, dirt and foreign objects and shall comply with the following requirements:

<u>Component</u>	<u>Percentage by Weight</u>	
	<u>White</u>	<u>Yellow</u>
Binder	18.0 Min.	18.0 Min.
Titanium Dioxide	10.0 Min.	---
Glass Beads	30 - 40	30 - 40
Calcium Carbonate and Inert Fillers	42.0 Max.	*
Yellow Pigments	---	*

*Relative amounts and types of yellow pigment, calcium carbonate and inert fillers shall be at the option of the manufacturer, provided that the other composition requirements of this Specification are met and the yellow pigment does not contain chromates or lead.

2. Physical Properties of Composition

- a. Colors

White thermoplastic composition, as placed, shall be white, free from dirt or tint, and shall match FED-STD-595C - Color 17886 . Yellow thermoplastic composition, as placed, shall be yellow, free from dirt, and shall match FED-STD-595C - Color 13538.

- b. Drying Time

When applied at a temperature of 412.5 ± 12.5 degrees F and in a thickness between 1/8 inch and 3/16 inch, the thermoplastic material shall be completely solid after it cools to ambient temperature and shall show no damaging effects from traffic after 2 minutes when the air temperature is 50 ± 3 degrees F and after 10 minutes when the air temperature is 90 ± 3 degrees F.

- c. Color Retention

The thermoplastic material shall not change color during the warranty period.

- d. Yellowness Index

White thermoplastic material shall not exceed a yellowness index of 0.12 when tested in accordance with AASHTO T 250.

- e. Softening Point

The thermoplastic material shall have a softening point of 215 ± 15 degrees F when tested in accordance with ASTM D 36.

- f. Specific Gravity

The specific gravity of the thermoplastic material as determined by a water displacement method at 25 degrees C shall not exceed 2.15.

g. Cracking Resistance at Low Temperature

After heating the thermoplastic material for 240 ±5 minutes at 425 ±3 degrees F, applying to concrete blocks and cooling at 15 ±3 degrees F, the material shall show no cracks.

h. Impact Resistance

After heating the thermoplastic material for 240 ±5 minutes at 425 ±3 degrees F and forming test specimens, the impact resistance after cooling to ambient temperature shall be a minimum of 10 inch-pounds.

i. Flowability

After heating the thermoplastic material for 240 ±5 minutes at 425 ±3 degrees F and testing for flowability, the residue (sample weight that doesn't flow out) of the white thermoplastic shall not exceed 18 percent and the residue of the yellow thermoplastic shall not exceed 21 percent.

j. Fumes

The thermoplastic material shall not exude fumes that are toxic, obnoxious and/or injurious to persons or property when it is heated during application.

B. Reflective Glass Spheres (Mix Component and Drop-On)

Reflective glass spheres for use in the thermoplastic composition and for drop-on shall conform to AASHTO M 247 - Type 1.

1. The glass spheres shall be colorless; clean; transparent; free from milkiness or excessive air bubbles, and essentially clean from surface scarring or scratching. They shall be spherical in shape and at least 70 percent of the glass beads shall be true spheres when tested in accordance with ASTM D 1155.
2. The refractive index of the spheres shall be a minimum of 1.50 as determined by the liquid immersion method at 25 degrees C.
3. The glass spheres shall have the following gradation when tested in accordance with ASTM D 1214.

<u>U.S. Standard Sieve</u>	<u>Mass % Passing</u>
No. 20	100
No. 30	75-95
No. 50	15-35
No. 100	0-5

4. Glass spheres for drop-on shall be treated with a moisture-proof coating meeting the flow requirements of AASHTO M 247 Section 4.4, shall not absorb moisture during storage, shall remain free from clusters and shall flow freely from dispensing equipment.

C. Primer

Primer for use on both bituminous and Portland cement concretes shall be of the type recommended by the manufacturer of the thermoplastic material and shall be designed to dry tack-free in under 5 minutes.

2.2 BASIS OF ACCEPTANCE

- A. Thermoplastic material will be accepted on the basis of sampling and inspection at the place of manufacture or in warehouse lots as determined by the Engineer. In addition, deliver all samples with the manufacturer's certified test results and identification of the binder formulation (e.g., "formulated as a hydrocarbon resin"). Any unauthorized tampering, opening or breaking of seals on the containers between the time of sampling and delivery to the construction site shall be cause for rejection of the material.
- B. The minimum batch size of thermoplastic material when tested shall be not less than 3000 lbs., unless the total order is less than that amount.
- C. Primers will be subject to approval by the Engineer prior to use. Requests for approval shall include technical data including brand name, instructions for use and hazard warnings.
- D. Any rejected materials shall be immediately replaced with materials meeting the requirements of this Section.

PART 3. EXECUTION

3.1 APPLICATION EQUIPMENT

A. General

Thermoplastic application equipment will be subject to approval by the Engineer prior to the start of application.

- 1. The equipment used for the placement of thermoplastic pavement markings shall be of two general types: mobile applicator and portable applicator.
- 2. Unless otherwise approved by the Engineer, all longitudinal pavement marking lines shall be striped using only mobile applicator equipment. Longitudinal pavement marking lines include broken lines (skip line), edge lines, barrier lines and solid lines as defined by the FHWA "MUTCD".
 - a. Portable applicator equipment will be acceptable for placing all other markings; and for longitudinal marking where use of mobile applicator equipment is impractical, as approved by the Engineer.
- 3. Apply thermoplastic material to the primed pavement surface by the extrusion method, wherein one side of the shaping die is the pavement and the other three sides are contained by, or are part of, equipment suitable for maintaining the temperature and controlling the flow of material.

4. For heating the thermoplastic material, the applicator equipment shall include melting kettle(s) of such capacity as to allow for continuous marking operations. The melting kettle(s) may be mounted on a separate "supply" vehicle or included as part of the application equipment. The kettle(s) shall be capable of automatically heating the thermoplastic material to, and maintaining it at, an indicated and accurate gauge temperature of 420 degrees F to 430 degrees F. The heating mechanism shall incorporate a thermostatically controlled indirect heat transfer medium. Direct heating of the melting kettle by flame will not be permitted.
 5. Thermoplastic material temperature gauges accurate to plus or minus 15 degrees F shall be provided at both ends of each kettle and reservoir, and in each extrusion shoe, in such a manner as to be visible so that an operator can monitor the thermoplastic material temperature throughout the marking operation.
 6. Applicator equipment including separate "supply" kettles shall be constructed to continuously mix and agitate the thermoplastic material. Conveying parts of the equipment between the main material reservoir and the extrusion shoe(s) shall be so constructed as to prevent accumulation and clogging. All parts of the equipment that come into contact with thermoplastic material shall be so constructed as to be easily accessible and exposable for cleaning and maintenance. The equipment shall be constructed so that mixing and conveying parts, up to and including the extrusion shoe(s), maintain the material at the required application temperature.
 7. The applicator equipment shall be so constructed as to:
 - a. Ensure continuous uniformity in the dimensions of the stripe;
 - b. Provide a means for cleanly cutting off stripe ends squarely;
 - c. Provide a method of applying "skip" lines; and
 - d. Be capable of applying various widths of traffic markings from 3 to 12 inches wide.
 8. The applicator equipment shall be equipped with a drop-on type bead dispenser capable of uniformly dispensing reflective glass spheres at controlled rates of flow up to 10 lbs. per 100 sq. ft. of thermoplastic material. The bead dispenser shall be automatically operated in such a manner that it will dispense beads only while the thermoplastic material is being applied.
 9. Applicator equipment shall be mobile and maneuverable to the extent that straight lines can be followed and normal curves can be made in a true arc.
- B. Mobile Applicator Equipment
1. The mobile applicator shall be a truck mounted, self-contained pavement marking machine that is capable of applying hot thermoplastic material by the extrusion method. The applicator shall be equipped to maintain and apply the thermoplastic material at an indicated and accurate gauge temperature of 420 degrees F and at the widths and thicknesses specified in this Section. The applicator shall be capable of operating continuously and of installing a minimum of 20,000 linear feet of longitudinal markings in 8 hours.

2. The mobile applicator shall be equipped with melting kettle(s) or materials storage reservoir(s) and a glass bead hopper of such capacity as to allow for continuous marking operations. The kettle(s) or reservoir(s) shall be capable of heating and holding the thermoplastic material at an indicated and accurate gauge temperature of 420 degrees F.
 3. The mobile applicator shall be equipped with an extrusion shoe(s) and shall be capable of marking edge line and center line stripes. The extrusion shoe(s) shall be:
 - a. Closed, heat jacketed or suitably insulated units;
 - b. Able to apply the molten thermoplastic at an indicated and accurate gauge temperature greater than 415 degrees F; and
 - c. Capable of extruding a uniform line pre-set at 3 to 12 inches wide at a thickness of not less than 1/8 inch nor more than 3/16 inch.
 4. The mobile applicator shall be equipped with an electronic and programmable line pattern control system, or mechanical control system, so as to be capable of applying skip or solid lines in any sequence, and through any extrusion shoe in any cycle length.
- C. Portable Applicator Equipment
1. The portable applicator shall be a hand operated equipment, specifically designed for placing hot extruded thermoplastic material in installations such as crosswalks; stop bars; legends; arrows; and short lengths of lane, edge and centerlines. The portable applicator reservoir shall be loaded with hot thermoplastic material from the supply vehicle melting kettle(s).
 2. The portable applicator shall be equipped with all necessary components (including material storage reservoir, glass bead hopper, temperature gauges, bead dispenser, extrusion shoe and heating accessories) so as to be capable of holding and applying the molten thermoplastic at indicated and accurate gauge temperatures greater than 415 degrees F; of extruding a line of generally uniform cross-section, pre-set at 3 to 12 inches in width, and at a thickness of not less than 1/8 inch nor more than 3/16 inch.

3.2 INSTALLATION

- A. General
1. Apply pavement markings at the locations and in accordance with the patterns and dimensions shown on the Contract Drawings and the FHWA "MUTCD".
 2. Before commencing any pavement marking Work, submit a schedule of operations to the Engineer for approval.
 3. When pavement markings are applied under traffic conditions, provide all necessary qualified personnel, flags, markers and signs to maintain and protect traffic and to protect marking operations and the new markings until thoroughly set. Perform short duration lane and work area closures in accordance with the requirements of "Maintenance of Traffic and Work Area Protection" of Division 1 - GENERAL PROVISIONS.
 4. Apply pavement markings in the general direction of traffic. Striping against the direction of traffic flow will not be permitted.

5. Remove all tracking marks, spilled thermoplastic and thermoplastic applied in unauthorized areas, to the satisfaction of the Engineer.
 6. When necessary, establish marking alignment points at 25 ft. intervals throughout the length of the marking area, or as otherwise approved by the Engineer.
 7. Apply thermoplastic pavement markings to dry pavement surfaces. At the time of installation, the pavement surface temperature shall be a minimum of 55 degrees F and the ambient temperature shall be a minimum of 49 degrees F and rising.
- B. Surface Cleaning and Preparation of Pavement
1. Clean the pavement surfaces to be marked to the satisfaction of the Engineer immediately prior to priming and marking application. Perform surface cleaning and preparation only in the area of the thermoplastic markings application.
 2. At the time of application of the thermoplastic material, ensure that all pavement surfaces are dry, free of oil, dirt, dust, grease and similar foreign materials and that the primer is tack-free.
- C. Application
1. Apply a primer to all pavement surfaces (new and existing) to be marked. Apply primer to bituminous concrete and Portland cement concrete pavements, as applicable, at the rates and in accordance with the recommendations of the manufacturer of the thermoplastic material. The primer shall dry tack-free in less than 5 minutes.
 2. Apply the thermoplastic material at an indicated and accurate gauge temperature no lower than 415 degrees F at the point of deposition. As used in this Section, the point of deposition shall be defined as within the extrusion shoe.
 3. Immediately following application, drop reflective glass spheres onto the molten thermoplastic marking at the rate of 5 lbs. per 100 sq. ft. of composition.
 4. Upon cooling to ambient pavement temperature, the resultant marking shall be a well-adhered reflectorized strip of a thickness not less than 1/18 inch nor more than 3/16 inch, and of the width and dimensions shown on the Contract Drawings, capable of resisting deformation by traffic. The exposed marking surface shall be smooth, with no pockmarks, blisters or other surface blemishes evidencing improper application, improper temperature or equipment malfunction. The pavement markings shall show a smooth alignment with continuous uniformity of the required dimensions and widths.

END OF SECTION

SECTION 02580

**THERMOPLASTIC REFLECTORIZED
PAVEMENT MARKINGS**

APPENDIX "A"

SUBMITTALS

Submit the following within 30 days of Contract award:

A. Product Data

Detailed catalog cuts and manufacturer's specifications of thermoplastic materials, reflective glass spheres and primer, and test data demonstrating conformance to the requirements of this Section.

END OF APPENDIX "A"

SECTION 02580

THERMOPLASTIC REFLECTORIZED PAVEMENT MARKINGS

INSTRUCTIONS TO SPECIFIER

A. Contract Drawings

Ensure that the Contract Drawings show the following items specified in the text:

- (2.01 A.1.a) Formulation of binder component: Hydrocarbon resin or alkaloid base product, or leave as Contractor's option, subject to Engineer's approval.
- (3.02 A.1) Locations, patterns and dimensions of pavement markings.
- (3.02 C.4) Widths and dimensions of reflectORIZED strips.

END OF INSTRUCTIONS

DIVISION 2

SECTION 02581C

**WET REFLECTIVE THERMOPLASTIC
PAVEMENT MARKINGS**

PART 1. GENERAL

1.01 SUMMARY

This Section specifies requirements for Wet Reflective Thermoplastic reflectorized pavement markings.

1.02 REFERENCES

The following is a listing of the publications referenced in this Section:

American Association of State Highway and Transportation Officials (AASHTO)

- AASHTO M 247 Glass Beads Used in Traffic Paints.
- AASHTO M 249 White and Yellow Reflective Thermoplastic Striping Material (Solid Form).
- AASHTO T 250 Standard Method of Test for Thermoplastic Traffic Line Material.

American Society for Testing and Materials (ASTM)

- ASTM D 36 Test Method for Softening Point of Bitumen (Ring-and-Ball Apparatus).
- ASTM D 92 Test Method for Flash and Fire Points
- ASTM D 153 Test Method for Specific Gravity of Pigments
- ASTM G 154 Standard Practice for Operating UV Lamp Apparatus for Exposure of Non- Metallic Materials
- ASTM D 570 Test Method for Water Absorption of Plastics
- ASTM D 1155 Test Method for Roundness of Glass Spheres.
- ASTM D 1213 Test Method for Crushing Resistance of Glass Spheres
- ASTM D 1214 Test Method for Sieve Analysis of Glass Spheres.
- ASTM E 1349 Test Method for Reflectance Factor and Color
- ASTM E 1710 Test Measurement for Measurement of Retro reflective Pavement Marking Materials
- ASTM E 2176 Test Method for Measuring the Coefficient of Retro reflected Luminance of Pavement Markings in a Standard Condition of Continuous Wetting
- ASTM E 2177 Test Method for Measuring the Coefficient of Retro reflected Luminance of Pavement Markings in a Standard Condition of Wetness
- ASTM D 2240 Test Method for Rubber Property – Durometer Hardness
- ASTM D 4960 Test Method for Evaluation of Color for Thermoplastic Marking Materials
- ASTM D 6359 Standard Specification for Minimum Retro reflectance of Newly

- Applied Pavement Markings
- ASTM D6628 Standard Specification for Color of Pavement Marking Materials
Federal Highway Administration (FHWA)
- MUTCD Manual on Uniform Traffic Control Devices.
Federal Standards
- FED. STD 595 Colors used in Government Procurements.

1.03 QUALITY ASSURANCE

- A. The quality and workmanship of the completed marking installation shall conform to 5.02 C. 9.
- B. Warranty: The completed marking installation shall be warranted to the Authority, from the date of issuance of the Certificate of Final Completion, against peeling, chipping, flaking, delamination and shoving for a period of one year. The warranty shall run to the Authority's benefit and shall grant the Authority a direct right of action against the manufacturer.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. The thermoplastic material shall be manufactured and packaged in suitable containers to which it will not adhere during shipment or storage. Each container shall be sealed at the point of manufacture and plainly marked with the color, basic resin type, wet reflective reflective elements and glass bead types included in the mix, manufacturer's name, batch number and date of manufacture, and a statement stating the contents meet the requirements of this Section. Each batch manufactured shall have its own separate number. The label shall warn the user that the material shall not be heated in excess of 440 degrees F.
- B. The wet reflective elements and glass spheres for drop-on application shall be shipped in strong moisture resistant bags. Each bag shall be marked with the name and address of the manufacturer, the name and weight of the material, a statement confirming that the contents meet the requirements of this Section, date of manufacture and batch number.
- C. Primer shall be shipped in pails, drums or other strong substantial containers. Each container shall be plainly marked with the brand name of the product, the name and address of the manufacturer, the date of manufacture, the quantity of material, the date of expiration or shelf life, and appropriate hazard warnings. Primers shall be shipped to the construction site with instructions for use affixed to each container.

1.05 SUBMITTALS

See Appendix "A" for submittal requirements.

PART 2. PRODUCTS

2.01 DESCRIPTION

This work shall consist of furnishing and installing a multiple component, wet reflective traffic marking system in accordance with this provision and in reasonably close conformance to the dimensions and lines shown on the plans or established by the Engineer.

This specification covers a wet reflective thermoplastic pavement striping material that is applied to the road surface in a molten state by mechanical means with surface application of wet reflective bonded core elements and glass beads.

The alkaloid thermoplastic material shall be applied by methods as called out in the plans and immediately followed by application of wet reflective bonded core elements and glass beads. Upon cooling to normal pavement temperatures the resulting traffic marking shall produce a stripe of specified thickness and width that is retroreflective in dry and continuous wet conditions and capable of resisting deformation by traffic.

2.02 MATERIALS

- A. The physical and chemical properties and requirements contained in this specification shall apply regardless of the thermoplastic supply.
- B. The thermoplastic material shall be homogeneously composed of pigment, binder, glass beads and wet reflective bonded core elements.
- C. The binder shall be based on maleic modified rosin ester resin and high boiling plasticizer. The binder shall be a minimum of 50% maleic modified rosin ester.
- D. The pigment beads and filler shall be well dispersed in the resin.
- E. The thermoplastic material shall be free of skins, dirt and foreign debris.
- F. The reflective media shall be made up of wet reflective bonded core elements and glass beads and shall conform to the following requirements:
 - 1. Glass Beads- The required beads shall have an index of refraction of 1.5 when tested by immersion method at 77° F. The glass beads shall have a minimum of 70% rounds as measured according to ASTM D 1155. The surface of the glass beads shall be free of pits and scratches. The glass beads retained on the # 40 US Mesh sieve (425 microns) shall have minimum crush strength of 30 pounds in accordance with ASTM D 1213.
 - 2. Glass beads (pre-mix) - The pre-mix beads shall conform to AASHTO M 247 (Type I) and FP96 (Type III) and do not require surface treatment.
 - 3. Glass beads (*surface-drop*) - Glass spheres in the size range of Type 3 shall be surface treated with an adhesion coating. Bead size distribution shall conform to the requirements stated in the second drop bead gradation, Table 1 below:
 - 4. Gradation of the Second Surface Drop of Glass Bead:
The gradation of the second drop must meet or be within the limits shown in Table 1.

Table 1. Gradation of the Second Drop of Glass Bead

Common Bead Types with Liquid Pavement Markings
Bead Gradations – Mass Percent Passing (ASTM D1214)

US Mesh	Micron	Type 3 Bead
12	1700	100
14	1410	95-100
16	1180	80-95
18	1000	10-40
20	850	0-5
25	710	0-2

**A minimum of 15% of the total weight shall be made from direct melt glass beads.

***All +30 U.S. Mesh beads shall be 85% minimum rounds.

There are many types of glass beads that meet or fit within this range from various manufacturers.

- G. Wet Reflective Bonded Core Elements (pre-mix and first surface-drop)-The bonded core reflective elements shall contain either clear or yellow tinted microcrystalline ceramic beads bonded to the core. All “dry-performing” microcrystalline ceramic beads bonded to the core shall have a minimum index of refraction of 1.70 when tested using the liquid oil immersion method. All “wet performing” microcrystalline ceramic beads bonded to the core shall have a minimum index of refraction of 2.30 when tested using the liquid oil immersion method indicated in Appendix A. Element size distribution shall conform to the requirements stated in the element gradation Table 2 below:

Table 2

Element Gradations Mass Percent Passing (ASTM D1214)		
US Mesh	Micron	“S” Series Elements
12	1700	85-100
14	1410	70-96
16	1180	50-90
18	1000	5-60
20	850	0-25
30	600	0-7

Surface Treatment – The bonded core elements shall be surface treated to optimize embedment and adhesion to the high build waterborne binder.

- H. Primer for use on both bituminous and Portland cement concretes shall be of the type recommended by the manufacturer of the thermoplastic material and shall be designed to dry tack-free in under 5 minutes.

PART 3. REQUIREMENTS

3.01 Use thermoplastic materials with the following characteristics:

- A. Does not deteriorate upon contact with pavement materials, petroleum droppings from traffic and chemicals, such as sodium chloride or calcium chloride, used to prevent formation of ice on roadways or streets.
- B. Does not scorch, discolor, or deteriorate if kept at the manufacturer’s recommended application temperature, or deteriorate if kept at the manufacturers recommended application temperature, or at least 400° F for 4 hours.
- C. Has a temperature versus viscosity characteristic that remains constant from batch to batch through 3-4 re-heat cycles.
- D. The thermoplastic material in the plastic state shall not exude fumes that are toxic, or cause injury to persons or property.
- E. The thermoplastic shall be supplied in either granular or block form.

3.02 COMPOSITION

- A. Composition – The pigment, glass beads, wet reflective bonded core elements and filler shall be uniformly dispersed in the resin. The thermoplastic shall be free of skins, dirt, and foreign objects and shall comply with requirements according to Table 3.

Table 3 - Composition

Wet Reflective Thermoplastic with Bonded Core Elements		
Component	Weight Percent	
	White	Yellow
Binder	20% minimum	20% minimum
Type I Glass Spheres	20% minimum	20% minimum
Type III Glass Spheres	15% minimum	15% minimum
Bonded Core Elements (color matched component)	5% minimum	None
Bonded Core Elements (color matched component)	None	5% minimum
TiO2, Type II Rutile	10% minimum	As needed
Pigment Yellow 83 (Lead Free)	None	See Note 1
Calcium Carbonate and Inert Filler (200 mesh sieve)	30% Minimum	See Note 1

Note 1- The amount of yellow pigment, calcium carbonate and inert fillers shall be at the option of the manufacturer, providing all other requirements of this specification are met.

- B. The thermoplastic material shall be produced without the use of lead chromate or arsenic.
- C. The thermoplastic shall contain clear glass beads as described in section 2.6.
- D. The thermoplastic shall contain wet reflective bonded core elements (microcrystalline ceramic beads) as described in section 2.7.
- E. The thermoplastic shall be formulated and manufactured from first-grade materials and specifically compounded for traffic markings.
- F. The thermoplastic shall resist smearing or spreading under normal traffic conditions below 120° F.
- G. The finished line maintains its original dimensions and placement.
- H. The finished line is free from tack below 120° F and is not slippery when wet.
- I. The thermoplastic line shall be homogenous with even distribution of pigments, beads and wet reflective bonded core elements throughout the plastic matrix.
- J. The physical properties of the thermoplastic line shall be uniform throughout the plastic matrix.
- K. The thermoplastic line shall resist lifting from the pavement in freezing weather and possess cold ductility properties that permit reasonable movement resulting from thermal expansion and contraction with the road surface to minimize chipping or cracking.

3.03 PHYSICAL CHARACTERISTICS

- A. Storage Life – The thermoplastic material shall meet the requirements of this specification and melt uniformly with no evidence of skins or un-melted particles for a period of one year.
- B. Yellowness Index – Test according to recommendations in ASTM D 4960 and make yellowness index measurements according to ASTM E 1349 using a 2 degree observer and D 65 illuminant. The yellowness index for the white thermoplastic shall not exceed 15.
- C. Set to Bear Traffic– When applied at a temperature range of 412.5 +/- 12.5°F and a thickness of 60 mils to 185 mils (1/16” – 3/16”) the material shall set to bear traffic in not more than 2 minutes when the air and road temperature is 50+/- 3° F. and not more than ten minutes when the air and road temperature is 90 +/- 3° F.
- D. Cracking Resistance at Low Temperature - After heating the thermoplastic for 240+/-5 minutes at 425 +/-3° F and then applying to concrete blocks, and cooling to 15+/-3.6° F the material shall show no cracks. Ref: (AASHTO T-250-04 section 12)

- E. Impact Resistance - After heating the thermoplastic for 240+/-5 minutes at 425 +/-3° F and making test specimens and testing per ASTM 256, Method A (un-notched), the impact resistance shall be a minimum of 8.8 inch-lbs (1.0 J) Ref: (AASHTO T-250-04 section 14)
 - F. Softening Point - After heating the thermoplastic for 240+/-5 minutes at 425 +/-3° F and testing in accordance with ASTM D 36 the materials shall have a softening point of 215 +/-15° F.
 - G. Flowability - After heating the thermoplastic for 240+/-5 minutes at 425 +/-3° F and testing for flowability, the white thermoplastic shall have a maximum percent residue of 18 and the yellow thermoplastic shall have a maximum percent residue of 21. Ref: (AASHTO T-250-04 section 11)
 - H. Flowability with Extended Heating - After heating the thermoplastic for 8.0 +/- 0.5 hrs at 425 +/-3° F, with stirring the last 6 hrs, and testing for flowability, the thermoplastic shall have a maximum percent residue of 28. Ref: (AASHTO T-250-04 section 17)
 - I. Flash Point – When tested in accordance with ASTM D 92 the thermoplastic will have a flash point not less than 475° F.
 - J. Indentation Resistance – Test according to ASTM D 2240 Shore Durometer, A2. Durometer and panel at 110° F with a 4.4 lb load applied. Measurement is taken after 15 seconds. The thermoplastic should have a minimum value of 40 and a maximum value of 75. Note: Extra care should be taken to ensure the intermix is thoroughly mixed and uniform in the test samples. A non-uniform sample will result in erratic measurement values.
- Note: During measurement of wet reflective thermoplastic containing large elements and or glass beads the durometer probe may impact a large bead or large element during the test resulting in a much higher than expected result. If the value is unreasonably high, it may be necessary to retest in another location on the sample.
- K. Specific Gravity – Test according to ASTM D 153. The thermoplastic should have a minimum no less than 1.9 maximum of no more than 2.3.
 - L. Water Absorption - Test according to ASTM D 570. The thermoplastic sample should have a maximum of 0.5% water absorption.
 - M. Ultra Violet Light and Condensate Exposure – Make samples and test according to ASTM G 154. After 300 hrs exposure the thermoplastic samples shall meet the requirements below.
 - N. Color – Make and test thermoplastic samples according to ASTM D 4960. Make color measurements according to ASTM D 6628-03 using a 2 degree observer and D 65 illuminant. The thermoplastic material, after heating for 240+/-5 minutes at 425 +/- 3° F and then cooled to 77+/-3° F shall meet the following criteria:
 - 1. White Reflectance: Daylight reflectance (*Cap Y*) measured at 45/0 degrees is 75% minimum.

2. White Color: The color shall reasonably match Federal Test Standard number 595B, color 17886 and shall be within the following chromaticity limits “color box” defined by plotting the following four (x,y) pairs on a C.I.E. 1931 chromaticity diagram.

$$(x_1, y_1) = (0.355, 0.355)$$

$$(x_2, y_2) = (0.305, 0.305)$$

$$(x_3, y_3) = (0.285, 0.325)$$

$$(x_4, y_4) = (0.335, 0.375)$$

3. Yellow Reflectance: Daylight reflectance (*Cap Y*) measured at 45/0 degrees is 45% minimum.

4. Yellow Color: The color shall reasonably match Federal Test Standard number 595B, color 13538 and shall be within the following chromaticity limits “color box” defined by plotting the following four (x,y) pairs on a C.I.E. 1931 chromaticity diagram.

$$(x_1, y_1) = (0.560, 0.440)$$

$$(x_2, y_2) = (0.490, 0.510)$$

$$(x_3, y_3) = (0.420, 0.440)$$

$$(x_4, y_4) = (0.460, 0.400)$$

PART 4. CHARACTERISCS OF FINISHED TRAFFIC MARKING

- 4.01 Retroreflectance – Typical initial retroreflectance are shown in Table 4 below. Typical retroreflectivity averaged over many readings [mcd(ft-2)(fc-1)] metric equivalent [mcd(m-2)(lux-1)].

Table 4

Typical Initial Retroreflectivity*		
Average values over many applications (mcd (ft-2) (fc-1) ; {metric equivalent mcd (m-2) (lux-1)})		
	White	Yellow
Dry (ASTM E1710)	500	405
Wet recovery (ASTM E2177)	500	405
Wet Continuous (ASTM E2176)	180	150

*Note : Typical Retroreflectivity results represent average performance for smooth pavement surfaces. Results may vary due to differences in pavement type and surface roughness. Increased element drop rate may be necessary to compensate for increased surface area characteristics of rough pavement surfaces.

- A. Some reasonable variance should be expected (for example, application on very rough road surfaces or differences in glass beads).
- B. The initial retroreflectance of a single installation shall be the average value determined to the measurement and sampling procedures outlined in ASTM D 6359, using a 30-meter (98.4 feet) retroflectometer. RL shall be expressed in units of millicandelas per square foot per foot-candle (mcd(ft-2)(fc-1)) metric equivalent [mcd(m-2)(lux-1)].

- C. Initial performance of pavement marking shall be measured no sooner than 4-7 days after application.
- D. Wet retroreflectance values measured under a “condition of continuous wetting” (simulated rain) shall be in accordance with ASTM E2176, and to reduce variability between measurements, the test method shall be performed in a controlled laboratory environment while the marking is positioned with a 3 to 5 degree lateral slope. Measurements shall be reported as the average of the minimum of three locations. Samples of the completed finished product shall be applied to flat panels during application and brought back to the lab for testing.

4.02 On The Road Track-Free Time – When applied at a temperature range of 412.5 +/- 12.5° F and a thickness of 60 mils to 185 mils (1/16” – 3/16”) the material shall set to bear traffic in not more than 2 minutes when the air and road temperature is 50+/- 3° F and not more than ten minutes when the air and road temperature is 90 +/- 3° F.

Track Free - shall be considered as the condition where no visual deposition of the traffic marking to the pavement surface is observed when viewed from a distance of 50 feet, after a free-rolling traveling vehicle’s tires have passed over the line.

4.03 Color After Application – The color of the applied white and yellow stripes and markings (with elements and beads) shall conform to the daytime and nighttime color requirements in ASTM Designation: D 6628-03.

- A. White Reflectance: Daylight reflectance (*Cap Y*) measured at 45/0 degrees is 35% minimum.
- B. White Color: The color shall reasonably match Federal Test Standard number 595B, color 17886 and shall be within the following chromaticity limits “color box” defined by plotting the following four (x,y) pairs on a C.I.E. 1931 chromaticity diagram.
 - (x1,y1) = (0.355, 0.355)
 - (x2,y2) = (0.305, 0.305)
 - (x3,y3) = (0.285, 0.325)
 - (x4,y4) = (0.335, 0.375)
- C. Yellow Reflectance: Daylight reflectance (*Cap Y*) measured at 45/0 degrees is 25% minimum.
- D. Yellow Color: The color shall reasonably match Federal Test Standard number 595B, color 13538 and shall be within the following chromaticity limits “color box” defined by plotting the following four (x,y) pairs on a C.I.E. 1931 chromaticity diagram.
 - (x1,y1) = (0.560, 0.440)
 - (x2,y2) = (0.490, 0.510)
 - (x3,y3) = (0.420, 0.440)
 - (x4,y4) = (0.460, 0.400)

PART 5. APPLICATION REQUIREMENTS

5.01 Equipment

- A. Equipment shall be capable of providing uniform heating of striping materials to temperatures exceeding 390° F.
- B. Equipment shall be capable of mixing and agitating the molten thermoplastic to provide a homogenous mixture and prevent settling of intermixed beads and wet reflective bonded core elements.
- C. Equipment shall be capable of maintaining the thermoplastic striping material in a plastic state in all mixing and conveying parts, including the line dispensing device until applied.
- D. Equipment shall be capable of producing varying widths and thickness of thermoplastic traffic stripes.
- E. The equipment shall be a mobile, truck mounted and self-contained pavement marking machine or a walk behind hand cart applicator with an accompanying mobile pre-meter.
- F. Mobile truck mounted applicators shall be capable of traveling at a uniform, predetermined speed over variable road grades to produce uniform application of striping material, following straight lines and making normal curves in a true arc. The equipment shall be capable of air-blasting the pavement, applying the thermoplastic stripe and immediately dropping the wet reflective bonded core elements and then glass beads in a single pass at speeds up to 8 mph.
- G. Hand cart applicators shall be capable of uniform application of striping material at walking speeds, following straight lines and making tight turns symbols and legends. Mobile equipment must be available to air blast the areas immediately prior to hand cart application of thermoplastic. The hand cart shall be capable of applying the thermoplastic stripe and immediately dropping the wet reflective bonded core elements and then glass beads in a single pass at walking speeds.
- H. The equipment shall be capable of application of wet reflective bonded core elements and then glass beads to the surface of the pavement marking by double drop application. The element dispenser for the first drop, wet reflective bonded core elements, shall be attached to the striping machine in such a manner that the elements are dispensed closely behind the thermoplastic application device (ribbon gun, screed, and spray gun). The glass bead dispenser for the second drop shall be attached to the striping machine in such a manner that the beads are dispensed immediately after the first drop (wet reflective bonded core elements).
- I. The applicator for the wet reflective bonded core elements and glass beads shall be equipped with an automatic cut-off control that is synchronized with the cut-off of the thermoplastic material.

1. The applicator for the wet reflective bonded core elements and glass beads shall be capable of delivering a uniform drop rate at variable thermoplastic application speeds.
2. The wet reflective bonded core elements and glass spheres are applied such that they appear uniform on the entire traffic stripe and markings.
3. The bonded core elements and glass beads are applied such that they are embedded 50%-60% for adhesion to the thermoplastic marking.
4. The melt kettle must be equipped with an automatic temperature control device and thermometer to thermostatically control the temperature and prevent overheating of the thermoplastic material. It must also be equipped with sufficient agitation to prevent settling of the beads and elements.
5. Must meet the requirements of the National Fire Protection Association and state and local authorities.

5.02 Installation

A. General

1. Apply pavement markings at the locations and in accordance with the patterns and dimensions shown on the Contract Drawings and the FHWA "MUTCD".
2. Before commencing any pavement marking Work, submit a schedule of operations to the Engineer for approval.
3. When pavement markings are applied under traffic conditions, provide all necessary qualified personnel, flags, markers and signs to maintain and protect traffic and to protect marking operations and the new markings until thoroughly set. Perform short duration lane and work area closures in accordance with the requirements of "Maintenance of Traffic and Work Area Protection" of Division 1 - GENERAL PROVISIONS.
4. Apply pavement markings in the general direction of traffic. Striping against the direction of traffic flow will not be permitted.
5. Remove all tracking marks, spilled thermoplastic and thermoplastic applied in unauthorized areas, to the satisfaction of the Engineer.
6. When necessary, establish marking alignment points at 25 ft. intervals throughout the length of the marking area, or as otherwise approved by the Engineer.
7. Apply thermoplastic pavement markings to dry pavement surfaces. At the time of installation: the pavement surface temperature shall be a minimum of 55 degrees F, the ambient temperature shall be a minimum of 49 degrees F and rising, the relative humidity shall be less than 85%.

B. Surface Cleaning and Preparation of Pavement

1. Clean the pavement surfaces to be marked to the satisfaction of the Engineer immediately prior to priming and marking application. Existing markings that show obvious signs of degradation or loss of adhesion shall be removed. Perform surface cleaning and preparation only in the area of the thermoplastic markings application.

2. At the time of application of the thermoplastic material, ensure that all pavement surfaces are dry, free of moisture, free of oil, dirt, dust, grease and similar foreign materials and that the primer is tack-free. All curing compounds used on new Portland cement concrete surfaces shall be removed.
 3. On new concrete pavements, cleaning operations shall not begin until sufficient cure time has elapsed after the placement of concrete. New concrete pavements shall be cleaned by either sandblasting or water blasting. When water blasting is performed, pavement markings shall be applied no sooner than 24 hours after the blasting has been completed. The extent of the blasting work shall be to clean and prepare the concrete surface such that:
 - a. There is no visible evidence of curing compound on the peaks of the textured concrete surface.
 - b. There are no heavy puddled deposits of curing compound in the valleys of the textured concrete surface.
 - c. All remaining curing compound is intact; all loose and flaking material is removed.
 - d. The peaks of the textured pavement surface are rounded in profile and free of sharp edges and irregularities.
 4. Restrictions - The Engineer shall determine further restrictions and requirements of weather and pavement conditions necessary to meet all application specifications and produce markings that perform to the satisfaction of the Engineer. If the pavement surface contains heavy tines or very large aggregate used in open grade friction course or stone matrix asphalt mixes it may require additional surface preparation prior to application of thermoplastic pavement markings.
- C. Application
1. Apply a primer to all pavement surfaces (new and existing) to be marked. Apply primer to bituminous concrete and Portland cement concrete pavements, as applicable, at the rates and in accordance with the recommendations of the manufacturer of the thermoplastic material. The primer shall dry tack-free in less than 5 minutes.
 2. Thickness – Thermoplastic material shall typically be applied to the pavement surface by the extrusion method (when specified, pavement marking re-capping may be applied by utilizing the spray method). Thermoplastic markings shall be placed in accordance with the following requirements:
 - a. The installation method utilized shall be capable of installing lines between 3 to 8 inches in width and of generally uniform cross section
 - b. The standard line thickness shall be not less than 125 mils (1/8 inch) nor more than 185 mils (3/16 inch)
 - c. The standard re-capping line thickness shall be a minimum thickness of 60 mils (1/16inch)
 3. Reflective Media Application – The specified reflective media shall be dropped at rates to achieve the following coating weights per Tables 5 and 6.

Table 5 Element Application Rates

Units	Wet Reflective Bonded Core Elements
Pounds per 4-inch linear foot	0.022
Pounds per 100 sq ft	6.6

Table 6 Glass Bead Application Rates

Units	Type 3 Bead
Pounds per 4-inch linear foot	0.026
Pounds per 100 sq ft	7.8

4. Adhesion – The contractor shall ensure that the thermoplastic marking is well adhered to the road surface, and that the glass spheres and wet reflective bonded core elements are well adhered to the binder with 50% to 60% embedment.
5. Retroreflectivity – The contractor shall ensure that the reflectorized thermoplastic pavement marking meets the following performance criteria Table 7:

Table 7

Typical Minimum Initial Retroreflectivity* Average values over many applications (mcd(ft-2)(fc-1); {metric equivalent mcd(m-2)(lus-1)})		
	White	Yellow
Dry (ASTM E1710)	400	325
Wet recovery (ASTM E2177)	400	325
Wet continuous (ASTM E2176)	150	125

* Note: Typical Retroreflectivity results represent average performance for smooth pavement surfaces. Results may vary due to differences in pavement type and surface roughness. Increased element drop rate may be necessary to compensate for increased surface area characteristic of rough pavement surfaces.

6. The average initial retroreflectance shall be determined according to the measurement and sampling procedures outlined in ASTM D 6359, using a 30 meter (98.4 feet) retroreflectometer. The 30 meter retroreflectometer shall measure the coefficient of retroreflected luminance, RL, at observation angle of 10.5 degrees and an entrance angle of 88.76 degrees. RL shall be expressed in units of millicandelas per square foot per foot-candle. [(mcd(ft-2)(fc-1)]. The metric equivalent shall be expressed in units of millicandelas per square meter per lux [(mcd(m-2)(lux-1)].
7. Initial performance of the pavement markings shall be measured no sooner than 4-7 days after application.

8. Wet retroreflectance values measured under a “condition of continuous wetting” (simulated rain) shall be in accordance with ASTM E2176, and to reduce variability between measurements, the test method shall be performed in a controlled laboratory environment while the marking is positioned with a 3 to 5 degree lateral slope. Measurements shall be reported as an average of a minimum of three locations. A sample of the complete finished product shall be applied to flat panels during application and brought back to the lab for testing.
9. Upon cooling to ambient pavement temperature, the resultant marking shall be an adherent reflectorized strip of a thickness not less than 1/16 inch nor more than 3/16 inch, and of the width and dimensions shown on the Contract Drawings, capable of resisting deformation by traffic. The exposed marking surface shall be smooth, with no pockmarks, blisters or other surface blemishes evidencing improper application, improper temperature or equipment malfunction. The pavement markings shall show a smooth alignment with continuous uniformity of the required dimensions and widths.

PART 6 INSPECTION AND TESTING

- A. At any time throughout the duration of the project, the contractor shall provide free access to his application equipment for inspection by the Engineer, his authorized representative, or a materials representative.
- B. During the application of the thermoplastic marking, the Engineer may request the following tests to verify application to the parameters required in this specification.
 1. Thickness – During appropriate locations along the alignment of the project site the Engineer may obtain a sample of the molten thermoplastic onto a test panel of aluminum for the purposes of checking of proper film thickness. The thermoplastic shall be applied without bonded core elements or glass spheres. Upon hardening, the thickness shall be verified by the Engineer to meet the requirements of the plan. The contractor shall provide to the Engineer the application speed of the equipment during the time of the sample.
 2. Reflective media – When required by the Engineer, the contractor shall demonstrate to the Engineer the proper calibration of wet reflective bonded core elements and glass beads compared with the manufacturer’s requirement and may be conducted by one of the two methods.
 - a. Pressurized delivery systems - The calibration shall be conducted with a graduated cylinder or other similar device. Wet reflective bonded core elements or glass beads shall be collected from the reflective element and glass bead guns for a timed period. The volume of the reflective elements and glass beads shall be measured and compared with the manufacturer’s requirements.

- b. Non-pressurized delivery systems – The calibration shall be conducted with catch pans of known geometry, sufficiently wide to capture the width of the drop. The pans are positioned in the marking application path on the road. Then, separately for each glass spheres and wet reflective bonded core elements, with the thermoplastic applicator off, the applicator is passed over the catch pan at the appropriate speed and drop rate. The catch is then weighed and the drop area is calculated from the length of the pan and the width of the drop. Drop rate = drop capture weight / ((drop width) X (drop length))
- 3. Application Panel – The contractor shall provide to the Engineer at least one representative sample coated onto an aluminum panel or equivalent. This panel will serve as a record of the project output and application conditions and settings.

SECTION 02581C

WET REFLECTIVE THERMOPLASTIC PAVEMENT MARKINGS

APPENDIX A SUBMITTALS

- A. Submit the following within 30 days of Contract award:

Product Data

Detailed catalog cuts and manufacturer's specifications of thermoplastic materials, wet reflective bonded core elements, reflective glass spheres, primer and test data demonstrating conformance to the requirements of this section.

- B. Bead Testing Procedure: Refractive index of beads by liquid immersion.

Equipment:

- Microscope (minimum 100X magnification)
- Light source-preferably sodium light or other monochromatic source, but not absolutely essential.
- Refractive index liquids. (R.P. Cargill Laboratories, Inc, Cedar Grove, NJ).
- Microscope slide and slide cover
- Mortar and pestle

Procedure:

- Using the mortar and pestle, crush a few representative beads and place a few of these crushed particles on a microscope slide.
- Place a drop of a refractive index liquid, with an index as close to that of the crushed particles as can be estimated, on the particles.
- Cover the slide with a microscope slide cover and view the crushed particles by transmitted light normal to the slide surface (illuminated from the bottom).
- Adjust the microscope mirror to allow a minimum light intensity for viewing. This is particularly important if sodium light is not used.
- Bring a relatively flat and transparent particle into focus by slightly raising and lowering the objective (microscope tube), look for one or both of the following:
 - Becke Line – This light line will appear to move either into the particle or away from it. In general, if the objective is lowered, the line will move toward the material of lower index.
 - Variation in Particle Brightness – When raising the objective from a sharp focus, the particle will appear to get brighter or darker than the surrounding field. If it becomes brighter, the particles have a higher refractive index than the liquid. If it becomes darker, the glass has a lower refractive index than the liquid. In both cases, the opposite will be true if the objectives lowered.
- This test can be used to confirm that the beads are above or below a specified index. It can also be used to give an accurate determination of the index (+ or – 0.001). This is done by using several refractive index liquids until a match or near match of indices occurs. The index of the glass will equal that of the liquid when no becke line and now variation in bed brightness is observed.

The size and quality of the beads shall be such that the performance requirements for the retroreflective pliant polymer shall be met.

Acid Resistance: The beads shall show resistance to corrosion of their surface after exposure to a 1% solution (by weight) of sulfuric acid. The 1% acid solution shall be made by adding 5.7cc of concentrated acid into 1000cc of distilled water. CAUTION: Always add the concentrated acid into the water, not the reverse. The test shall be performed as follows:

Take a 1" x 2" sample, adhere it to the bottom of a glass tray and place just enough acid solution to completely immerse the sample. Cover the tray with a piece of glass to prevent evaporation and allow the sample to be exposed for 24 hours under these conditions. Then decant the acid solution (do not rinse, touch or otherwise disturb the bead surfaces) and dry the sample while adhered to the glass tray in a 150° F. (66° C.) oven for approximately 15 minutes.

Microscopic examination (20X) shall show no more than 15% of the beads having a formation of a very distinct opaque white (corroded) layer on their entire surface.

END OF APPENDIX "A"

SECTION 02581C
WET REFLECTIVE THERMOPLASTIC
PAVEMENT MARKINGS
INSTRUCTIONS TO SPECIFIER

A. Contract Drawings

Ensure that the Contract Drawings show the following items specified in the text:

Locations of existing pavement markings that are to be removed

Locations, patterns and dimensions of pavement markings

Widths and dimensions of reflectorized strips

Markings to be re-capped must be identified on the contract plans

DIVISION 2**SECTION 02583C****PREFORMED WET REFLECTIVE
PAVEMENT MARKING TAPE****PART 1. GENERAL**

1.01 SUMMARY

This Section specifies requirements for the following:

- A. Furnishing and installing preformed wet reflective pavement marking tape for lane lines, stop lines, crosswalks, traffic arrows, symbols and legends.
- B. Preparation of pavement surfaces for installation of markings, including removal of existing pavement markings.

1.02 REFERENCES

The following is a listing of the publications referenced in this Section.

American Society for Testing and Materials (ASTM)

ASTM D 1535	Practice for Specifying Color by the Munsell System
ASTM D 4061	Test Method for Retroreflectance of Horizontal Coatings
ASTM E 303	Test Method for Measuring Surface Frictional Properties using the British Pendulum Tester
ASTM E 2177	Test Method for Measuring the Coefficient of Retroreflected Luminance of Pavement Markings in a Standard Condition of Wetness
ASTM E 2832	Test Method for Measuring the Coefficient of Retroreflected Luminance of Pavement Markings in a Standard Condition of Continuous Wetting

Federal Highway Administration (FHWA)

MUTCD	Manual on Uniform Traffic Control Devices
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1.03 QUALITY ASSURANCE

A. Tolerances

1. Width of Lines: Minus zero, plus 1/8 inch of marking width specified in the Contract Documents.
2. Length of skip lane lines and unpainted surface between the skip lines: shall be plus or minus 3 inches.
3. Location of Directional Arrows, Messages, and Stripes: shall be within 2 inches of locations shown in the Contract Documents.
4. Size of Letters and Arrows: shall be plus or minus 2 inches.

- B. Warranty: The completed marking installation shall be warranted to the Authority, from the date of issuance of the Certificate of Final Completion, against peeling, chipping, flaking, delamination and shoving for a period of one year. The warranty shall run to the Authority's benefit and shall grant the Authority a direct right of action against the manufacturer.

1.04 DELIVERY, STORAGE AND HANDLING

All specified materials shall be handled in accordance with manufacturers recommendations.

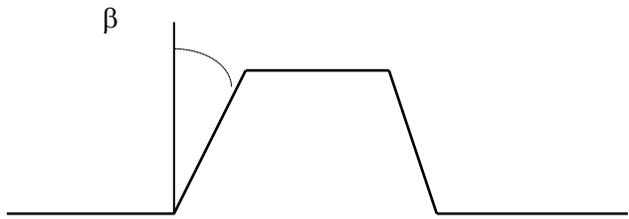
1.05 SUBMITTALS

See "Appendix A" for submittal requirements.

PART 2. PRODUCTS

2.01 MATERIALS

- A. The preformed wet reflective patterned pavement marking tape shall consist of two types. The standard width of lane line materials to be furnished and installed shall be as indicated in the Contract Documents and as directed by the Engineer:
 - 1. Non-Contrast Markings shall be placed, as indicated in the contract documents, and shall typically be used for lane lines, edge lines, stop lines, crosswalks, traffic arrows, symbols and legends and shall consist of a durable retroreflective white or yellow pliant polymer film.
 - 2. Contrast Markings shall be placed, as indicated in the contract documents, and shall typically be used on light colored asphalt or Portland Cement Concrete pavement for lane lines. The preformed contrast markings shall consist of the retroreflective white or yellow pliant polymer film with a matte black preformed raised diamond patterned film border bonded to the marking edges to form a continuous roll. The total width of the preformed contrast tape shall be an additional three inches wider than the standard width specified. This additional three inch width shall be a black non-reflective film with one and a half inches on both sides of the white or yellow film.
- B. Composition: The retroreflective, patterned pliant polymer pavement markings shall consist of a mixture of high-quality polymeric materials, pigments and glass beads distributed throughout its base cross-sectional area, with a reflective layer of microcrystalline ceramic beads bonded to a durable polyurethane topcoat surface. The patterned surface shall have approximately 50% (+/-15%) of the surface area raised and presenting a near vertical face (β angle of 0° to 60°) to traffic from any direction. (See diagram below.) The channels between the raised areas shall be substantially free of exposed beads or particles.



C. Retroreflectance: The white and yellow portion of the markings shall have the following initial expected retroreflectance values as measured in accordance with the testing procedures of ASTM D4061. The photometric quantity to be measured shall be coefficient of retroreflected luminance (RL) and shall be expressed as millicandelas per square foot per foot-candle [(mcd • ft-2) • fc-1]. The metric equivalent shall be expressed as millicandelas per square meter per lux [(mcd • m-2) • lx-1].

Retroreflectance values shall be measured under dry conditions in accordance with the testing procedures of ASTM D4061.

Retroreflectance values shall be measured under wet conditions in accordance with ASTM E2177. Wet retroreflectance values measured under a “condition of continuous wetting” (simulated rain) shall be in accordance with ASTM E2832, and to reduce variability between measurements, the test method shall be performed in a controlled laboratory environment while the marking is positioned with a 3 to 5 degree lateral slope. A wetting agent shall be used to improve wetting of the pavement marking by the water. It is recommended that a 0.1% by volume liquid soap solution be used. Measurements shall be reported as an average for each roll tested, in a minimum of three locations.

Wet retroreflectance values measured under a “condition of wetness” shall be in accordance with ASTM E2832, and the test may be performed with the marking installed on the road. New markings shall be tested using a wetting agent, as previously described. Laboratory measurements shall be performed using a 3 to 5 degree lateral slope. Measurements shall be reported as an average for each roll tested, in a minimum of three locations.

Table 1

Expected Initial Retroreflectance (RL)

	White		Yellow	
	Dry	Wet & Rainy	Dry	Wet & Rainy
Entrance Angle	88.76°*	88.76°*	88.76°*	88.76°*
Observation Angle	1.05°	1.05°	1.05°	1.05°
Retroreflected Luminance, RL	700	300	500	250

* The test instrument shall use an Entrance Angle of 88.76° and Observation Angle of 1.05° which represents a simulated driver viewing geometry at a 30 meter distance. D4061.

- D. Preformed markings shall be suitable for application to Portland Cement Concrete with a pre-coated pressure sensitive adhesive. A primer shall be used to precondition the pavement surface in accordance with manufacturer recommendations. Following proper priming, application, and tamping, the markings shall be immediately ready for traffic.
- E. All pavement marking materials shall be manufactured and packaged in accordance with the manufacturer's recommendations. The preformed markings shall be suitable for use for one year after the date of receipt when stored in accordance with the manufacturer's recommendations.
- F. Beads: Index of Refraction: All "dry-performing" microcrystalline ceramic beads bonded to the polyurethane-coated, patterned surface of the material shall have a minimum index of refraction of 1.70 when tested using the liquid oil immersion method. All "wet-performing" microcrystalline ceramic beads bonded to the polyurethane-coated, patterned surface of the material shall have a minimum index of refraction of 2.3 when tested using the liquid oil immersion method. The glass beads mixed into the pliant polymer shall have a minimum index of refraction of 1.5 when tested by the liquid oil immersion method (see Appendix A).
- G. The preformed plastic film shall provide a neat and durable marking that will not flow or become distorted due to temperature. The preformed plastic film shall be weather resistant, shall show no appreciable fading, lifting or shrinkage throughout the life of the marking and shall show no significant tearing, roll back, movement or other signs of poor adhesion.
- H. Thickness: The patterned material without adhesive shall have a minimum caliper of 0.085" at the thickest portion of the patterned cross-section and a minimum caliper of 0.02" at the thinnest portion of the cross-section.
- I. Pigments shall be compounded to maintain the original film color throughout the expected life of the film. White film composition, as placed, shall be white, free from dirt or tint. Yellow film composition, as placed, shall be yellow, free from dirt or tint, and shall be a reasonable visual match to Munsell book notation 10YR8/14 in accordance with ASTM D 1535. Contrast markings shall include a durable matte black non-reflective pliant polymer border.
- J. Legends, symbols and line markings shall conform to the applicable shapes and sizes specified in the FHWA Manual on Uniform Traffic Control Devices for Streets and Highways and shall be fabricated from maximum width material to provide the fewest number of contiguous pieces
- K. Skid Resistance: The patterned surface of the retroreflective pliant polymer shall provide an initial average skid resistance value of 45 BPN when tested according to ASTM E303, except that values shall be taken in one direction and then at a 45° angle from that direction. These two values shall then be averaged to find the skid resistance of the patterned surface.

- L. Patchability: The pavement marking material shall be suitable for use for patching worn areas of the same type in accordance with manufacturer's instructions.
- M. The pavement marking material shall be suitable for installation under the following minimum air and pavement temperatures:
 - Air Temperature: 40° F
 - Pavement surface Temperature: 40° F
- N. The pavement marking material shall be manufactured without the use of lead chromate or other similar lead-containing chemicals.

PART 3. EXECUTION

3.01 INSTALLATION

A. General

1. Apply pavement markings at the locations and in accordance with the patterns and dimensions shown on the Contract Drawings. Dimensional tolerances of markings shall be as specified in Section 1.03 of this specification.
2. The Engineer shall be notified 48 hours prior to the times when pavement marking and striping are scheduled to be performed.
3. When pavement markings are applied under traffic conditions, provide all necessary qualified personnel, and traffic control devices to maintain and protect traffic, and to protect marking operations and the new markings until thoroughly set. Perform short duration lane and work area closures in accordance with the requirements of "Maintenance of Traffic and Work Area Protection" of Division 1 – GENERAL PROVISIONS.
4. Apply markings in strict accordance with the manufacturer's installation instructions.

B. Cleaning and Preparation of Pavement Surfaces

1. Cleaning and surface preparation shall be confined to the surface area shown on the Contract Drawings for the application of pavement marking material and for the surface area of existing pavement markings that are shown on the Contract Drawings for removal. The planned means for cleaning, removing or obliterating existing or unsatisfactory markings shall be submitted to the Engineer for approval prior to starting surface preparation work.
2. Surface preparation work shall include cleaning for lines or cleaning for letters and symbols. Lines include broken line; dotted line; solid line; channelizing line; barrier lines; stop lines; crosswalk lines; and crossbars. When lines are installed, the area of preparation shall be at least the width of the new pavement marking, or existing line, plus 1 inch on each side. When letters and symbols are installed the area of preparation shall be sufficiently large to accommodate the new marking, or to remove the existing marking. Materials used for cleaning pavement of existing marking and any new spills, spatter, or overspray shall not damage the paved surface.

3. Whenever a marking area is cleaned by grinding, scraping, or sandblasting, the cleaning Work shall be conducted in such a manner that the finished pavement surface is not damaged or left in a pattern that will mislead or misdirect the motorist. When such cleaning Work is completed, the pavement surface shall be thoroughly blown-off with compressed air to remove residue and debris resulting from such Work.
4. On new concrete pavements, do not start cleaning operations until sufficient cure time has elapsed after the placement of concrete unless otherwise approved by the Engineer. Clean new concrete pavements by either sandblasting or water blasting. When water blasting is performed, apply pavement markings no sooner than 24 hours after the blasting has been completed. The extent of the blasting work shall be to clean and prepare the concrete surface such that:
 - a. There is no visible evidence of curing compound on the peaks of the textured concrete surface.
 - b. There are no heavy puddle deposits of curing compound in the valleys of the textured concrete surface.
 - c. All remaining curing compound is intact; all loose and flaking material is removed.
 - d. The peaks of the textured pavement surface are rounded in profile and free of sharp edges and irregularities.
5. Existing pavement markings shall be removed for the purpose of preparing the pavement surface for the application of new pavement markings in the same location as the existing markings, or to remove existing markings that are in good condition which, if allowed to remain, will interfere with or otherwise conflict with newly applied marking patterns as determined by the Engineer in his sole discretion. New pavement markings shall not be applied over existing markings unless approved by the Engineer.

C. Application

1. Install markings at the locations shown in the Contract Documents, in accordance with the manufacturer's installation instructions. Marking configurations shall be in accordance with the FHWA "Manual on Uniform Traffic Control Devices."
2. Provide application equipment as necessary for the job requirements. Equipment shall be capable of applying an unlined, pre-coated pressure sensitive adhesive pavement marking tape. The manual unit shall have a manually actuated tape advance system and a foot-operated cutting mechanism.
3. Apply pavement markings in the general direction of traffic. Striping against the direction of traffic flow will not be permitted.
4. Establish marking alignment points throughout the length of the marking area as approved by the Engineer.
5. Longitudinal lines shall be offset at least 2 inches from construction joints of Portland Cement Concrete pavements and joints or shoulder breaks of bituminous concrete pavements.

6. Repair or remove and reapply any pavement markings that fail to satisfy the requirements specified in this Section, at no additional cost to the Authority. Do not commence corrective work until after submitting repair method and obtaining Engineer's written approval.
7. Furnish and install surface preparation adhesive, as required, in accordance with manufacturers' recommendations.

3.02 PERFORMANCE WARRANTY

The manufacturer shall warrant that white and yellow pavement marking material sold for this application will remain effective for its intended use under normal traffic conditions and meet the minimum retained coefficient of dry retroreflection value of 100 millicandelas per foot squared per foot-candle (in accordance with ASTM D4061), subject to the following provisions:

Table 2

Warranty Periods

Application*	Dry Retroreflectivity Warranty Period
Longitudinal Markings	4 years
Symbols and Legends	2 years

*Applications in mountainous, heavy snowfall areas above 5,000 ft. (1,500m) are not covered by this warranty.

If the pavement markings are applied in accordance with all the manufacturer's application recommendations and fail during the warranty period, fail to adhere to the roadway, or fail due to complete wear-through during the warranty period shown above (from the date of installation), the manufacturer's sole responsibility and purchaser's and user's exclusive remedy shall be:

Manufacturer will provide the replacement materials that will restore the pavement marking retroreflectivity values to warranty levels or greater.

Conditions

Such failure must be solely the result of design or manufacturing defects in the pavement marking material and not of outside causes such as improper installation or substrate failure. Failure to follow recommended application procedures will void this warranty.

Damage to pavement markings caused by snow removal equipment is not covered under this warranty.

A visual night inspection must be made with a manufacturer's representative and a customer representative present to identify areas of the installation which appear to be below the minimum dry retained reflectance values of 100 millicandelas per foot squared per foot-candle. Areas which appear to be below the minimum retained reflectance value shall be identified as "zones of measurement." To qualify for material replacement, a "zone" must be at least 360 feet in road length and consist of either edge lines, center lines or lane lines, but not in combination, or a single word or symbol marking. Detailed reflectance measurement procedures are provided in the product bulletin provided by the manufacturer.

END OF SECTION

SECTION 02583C

PREFORMED WET REFLECTIVE PAVEMENT MARKING TAPE

APPENDIX A SUBMITTALS

- A. Submit the following within 30 days of Contract award:

Product Data

Detailed catalog cuts and manufacturer's specifications of marking materials, wet reflective bonded core elements, reflective glass spheres, primer and test data demonstrating conformance to the requirements of this section.

- B. Bead Testing Procedure: Refractive index of beads by liquid immersion.

Equipment:

- Microscope (minimum 100X magnification)
- Light source-preferably sodium light or other monochromatic source, but not absolutely essential.
- Refractive index liquids. (R.P. Cargill Laboratories, Inc, Cedar Grove, NJ).
- Microscope slide and slide cover
- Mortar and pestle

Procedure:

- Using the mortar and pestle, crush a few representative beads and place a few of these crushed particles on a microscope slide.
- Place a drop of a refractive index liquid, with an index as close to that of the crushed particles as can be estimated, on the particles.
- Cover the slide with a microscope slide cover and view the crushed particles by transmitted light normal to the slide surface (illuminated from the bottom).
- Adjust the microscope mirror to allow a minimum light intensity for viewing. This is particularly important if sodium light is not used.
- Bring a relatively flat and transparent particle into focus by slightly raising and lowering the objective (microscope tube), look for one or both of the following:
 - Becke Line – This light line will appear to move either into the particle or away from it. In general, if the objective is lowered, the line will move toward the material of lower index.
 - Variation in Particle Brightness – When raising the objective from a sharp focus, the particle will appear to get brighter or darker than the surrounding field. If it becomes brighter, the particles have a higher refractive index than the liquid. If it becomes darker, the glass has a lower refractive index than the liquid. In both cases, the opposite will be true if the objectives lowered.
- This test can be used to confirm that the beads are above or below a specified index. It can also be used to give an accurate determination of the index (+ or – 0.001). This is done by using several refractive index liquids until a match or near match of indices occurs. The index of the glass will equal that of the liquid when no becke line and now variation in bed brightness is observed.

The size and quality of the beads shall be such that the performance requirements for the retroreflective pliant polymer shall be met.

Acid Resistance: The beads shall show resistance to corrosion of their surface after exposure to a 1% solution (by weight) of sulfuric acid. The 1% acid solution shall be made by adding 5.7cc of concentrated acid into 1000cc of distilled water. CAUTION: Always add the concentrated acid into the water, not the reverse. The test shall be performed as follows:

Take a 1" x 2" sample, adhere it to the bottom of a glass tray and place just enough acid solution to completely immerse the sample. Cover the tray with a piece of glass to prevent evaporation and allow the sample to be exposed for 24 hours under these conditions. Then decant the acid solution (do not rinse, touch or otherwise disturb the bead surfaces) and dry the sample while adhered to the glass tray in a 150° F. (66° C.) oven for approximately 15 minutes.

Microscopic examination (20X) shall show no more than 15% of the beads having a formation of a very distinct opaque white (corroded) layer on their entire surface.

END OF APPENDIX "A"

SECTION 02583C

PREFORMED WET REFLECTIVE PAVEMENT MARKING TAPE INSTRUCTIONS TO SPECIFIER

A. Contract Drawings

Ensure that the Contract Drawings show the following items specified in the text:

Locations of existing pavement markings that are to be removed

Locations, patterns and dimensions of pavement markings

Widths and dimensions of reflectorized stripes

DIVISION 2

SECTION 02584C PREFORMED REMOVABLE WET REFLECTIVE PAVEMENT MARKING TAPE

PART 1. GENERAL

1.01 SUMMARY

This Section specifies requirements for the following:

- A. Preformed removable wet reflective pavement marking tape for temporary applications of lane lines, stop lines, crosswalks, traffic arrows, symbols, and legends.
- B. Removal of existing pavement markings.

1.02 REFERENCES

The following is a listing of the publications referenced in this Section:

American Society for Testing and Materials (ASTM International)

ASTM E 303	Test Method for Measuring Surface Frictional Properties Using the British Pendulum Tester.
ASTM D 1535	Practice for Specifying Color by the Munsell System.
ASTM E 2176	Test Method for Measuring the Coefficient of Retroreflected Luminance of Pavement Markings in a Standard Condition of Continuous Wetting (R_{L-Rain}).
ASTM E 2177	Test Method for Measuring the Coefficient of Retroreflected Luminance (R_L) of Pavement Markings in a Standard Condition of Wetness.
ASTM D 4061	Test Method for Retroreflectance of Horizontal Coatings
	<u>Federal Highway Administration (FHWA)</u>
MUTCD	Manual on Uniform Traffic Control Devices.

1.03 QUALITY ASSURANCE

A. Tolerances:

1. Width of Lines: Minus zero, plus 1/8 inch.
2. Length of skip or lane lines and unpainted surface between the skip lines: Plus or minus 3 inches.
3. Location of Directional Arrows, Messages, and Stripes: Within 2 inches of locations shown on the Contract Drawings.
4. Size of Letters and Arrows: Plus or minus 2 inches.

B. Warranty:

The completed marking installation shall be warranted to the Authority, from the date of issuance of the Certificate of Final Completion, against peeling, chipping, flaking, delamination and shoving for a period of one year. The warranty shall run to the Authority's benefit and shall grant the Authority a direct right of action against the manufacturer.

1.04 DELIVERY, STORAGE AND HANDLING

All specified materials shall be handled in accordance with manufacturers recommendations.

1.05 SUBMITTALS

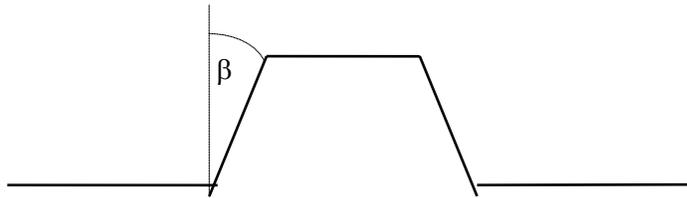
See Appendix "A" for submittal requirements.

PART 2. PRODUCTS

2.01 MATERIALS

- A. Prefabricated legends, symbols and line markings shall conform to the specified shapes and sizes in accordance with FHWA's MUTCD and shall be fabricated from maximum width material to provide the least number of contiguous pieces.
- B. Prefabricated lines, legends and symbols shall be precoated with a pressure-sensitive adhesive which is compatible with bituminous concrete and Portland cement concrete, and which adheres securely to the roadway at minimum air and pavement temperatures of 50 degrees F.
- C. The preformed patterned markings shall consist of white or yellow films with clear microcrystalline ceramic beads incorporated to provide immediate and continuing retroreflection during both wet and dry conditions. This film shall be manufactured without the use of lead chromate pigments or other similar, lead-containing chemicals.
- D. The quality of the pavement marking shall be such that the performance requirements for the marking shall be met.
- E. The preformed pliant polymer tape shall provide a neat and durable marking that will not flow or become distorted due to temperature. The preformed pliant polymer tape shall be weather resistant, shall show no appreciable fading, lifting or shrinkage throughout the life of the marking and shall show no significant tearing, roll back, movement or other signs of poor adhesion.
- F. The tape shall conform to roadway surface contours, breaks and faults during the action of traffic. The tape shall have the characteristic of fusing with itself and previously applied marking film of the same composition.
- G. Pigments shall be compounded to maintain the original film color throughout the expected life of the tape. White tape composition, as placed, shall be white, free from dirt or tint and shall be a reasonable visual match to Munsell Book Notation N 9.5/0 in accordance with ASTM D 1535. Yellow tape composition, as placed, shall be yellow, free from dirt or tint, and shall be a reasonable visual match to Munsell book notation 10YR8/14 in accordance with ASTM D 1535.

- H. All pavement marking materials shall be manufactured and packaged in accordance with the manufacturer's recommendations and in a manner to permit storage for a period of not less than one year from date of purchase. All wet reflective pavement marking tapes and surface preparation adhesives shall be stored in a cool dry area indoors and shall be kept from freezing.
- I. The removable wet reflective pavement marking tape must be designed and constructed in such a manner that it can be readily removed when the markings are no longer applicable. The tape shall be capable of performing for the duration of a normal construction season and shall then be capable of being removed intact or in large pieces. The tape shall be wet and dry reflective throughout its useful life. (A normal construction season is defined as the time after the last snowplowing in the spring and before the first snowplowing in the fall/winter. Removable pavement markings for work zones are not intended for multi-year applications.)
- J. Composition: The retroreflective pliant polymer pavement markings shall consist of a mixture of high-quality polymeric materials, pigments and glass beads distributed throughout its base cross-sectional area, with a reflective layer of microcrystalline ceramic beads bonded to a durable polyurethane topcoat surface. The patterned surface shall have approximately $20\% \pm 10\%$ of the surface area raised and presenting a near vertical face (β angle of 0° to 60°) to traffic from any direction. (See diagram below.) The channels between the raised areas shall be substantially free of exposed beads or particles.



- K. Retroreflectance: The white and yellow markings shall have the initial expected retroreflectance values as shown in Table 1 under dry, wet, and rainy conditions. The photometric quantity to be measured shall be coefficient of retroreflected luminance (RL) and shall be expressed as millicandelas per square foot per foot-candle [(mcd • ft⁻²) • fc⁻¹]. The metric equivalent shall be expressed as millicandelas per square meter per lux [(mcd • m⁻²) • lx⁻¹].

Retroreflectance values shall be measured under dry conditions in accordance with the testing procedures of ASTM D 4061.

Retroreflectance values shall be measured under wet conditions in accordance with ASTM E 2176 or ASTM E 2177. Wet retroreflectance values measured under a “condition of continuous wetting” (simulated rain) shall be in accordance with ASTM E 2176, and to reduce variability between measurements, test method shall be performed in controlled laboratory environment while the marking is positioned with a 3 to 5 degree lateral slope. A wetting agent shall be used to improve wetting of the pavement marking by the water. It is recommended that a 0.1% by volume liquid soap solution be used. Measurements shall be reported as an average for each roll tested, in a minimum of three locations.

Wet retroreflectance values measured under a “condition of wetness” shall be in accordance with ASTM E 2177, and the test may be performed with the marking installed on the road. New markings shall be tested using a wetting agent, as previously described. Laboratory measurements shall be performed using a 3 to 5 degree lateral slope. Measurements shall be reported as an average for each roll tested, in a minimum of three locations

Table 1
Expected Initial R_L under Dry, Wet, and Rainy Conditions

WHITE	<u>Dry</u>	<u>Wet & Rainy</u>
Entrance Angle	88.76°	88.76°
Observation Angle	1.05°	1.05°
Retroreflected Luminance R _L [(mcd • m ⁻²) • lx ⁻¹]	500	250
YELLOW	<u>Dry</u>	<u>Wet & Rainy</u>
Entrance Angle	88.76°	88.76°
Observation Angle	1.05°	1.05°
Retroreflected Luminance R _L [(mcd • m ⁻²) • lx ⁻¹]	300	200

Note: The test instrument shall use an Entrance Angle of 88.76° and Observation Angle of 1.05° which represent a simulated driver viewing geometry at a 30 meter distance.

- L. Beads: Index of Refraction: All “dry-performing” microcrystalline ceramic beads bonded to the polyurethane-coated, patterned surface of the material shall have a minimum index of refraction of 1.70 when tested using the liquid oil immersion method. All “wet-performing” microcrystalline ceramic beads bonded to the polyurethane-coated, patterned surface of the material shall have a minimum index of refraction of 2.30 when tested using the liquid oil immersion method. The glass beads mixed into the pliant polymer shall have a minimum index of refraction of 1.5 when tested by the liquid oil immersion method (see Appendix A).
- M. The size and quality of the beads shall be such that the performance requirements for the retroreflective pliant polymer shall be met.
- N. Color: The preformed markings shall consist of white and yellow films with pigments selected and blended to conform to standard highway colors.
- O. Removability: The pavement markings shall be removable from Asphalt concrete and Portland cement concrete intact or in large pieces, at temperatures above freezing without the use of heat, solvents, grinding or blasting without permanently scarring the roadway surface.

- P. Skid Resistance: The patterned surface of the retroreflective pliant polymer shall provide an initial average skid resistance value of 45 BPN when tested according to ASTM E 303 except values shall be taken in one direction and then at a 45° angle from that direction. These two values shall then be averaged to find the skid resistance of the patterned surface.
- Q. Patchability: The pavement marking material shall be capable of use for patching worn areas of the same type in accordance with manufacturer's instructions.
- R. Thickness: The patterned material without adhesive shall have a minimum caliper of 0.075 inches at the thickest portion of the patterned cross-section and a minimum caliper of 0.020 inches at the thinnest portion of the cross-section.

PART 3. EXECUTION

3.01 INSTALLATION

A. General

1. Apply pavement markings at the locations and in accordance with the patterns and dimensions shown on the Contract Drawings. Dimensional tolerances of markings shall be as specified in Section 1.03 of this specification.
2. The Engineer shall be notified 48 hours prior to the times when pavement marking and striping are scheduled to be performed.
3. When pavement markings are applied under traffic conditions, provide all necessary qualified personnel, and traffic control devices to maintain and protect traffic, and to protect marking operations and the new markings until thoroughly set. Perform short duration lane and work area closures in accordance with the requirements of "Maintenance of Traffic and Work Area Protection" of Division 1 – GENERAL PROVISIONS.
4. Apply markings in strict accordance with the manufacturer's installation instructions.

B. Cleaning and Preparation of Pavement Surfaces

1. Cleaning and surface preparation shall be confined to the surface area shown on the Contract Drawings for the application of pavement marking material and for the surface area of existing pavement markings that are shown on the Contract Drawings for removal. The planned means for cleaning, removing or obliterating existing or unsatisfactory markings shall be submitted to the Engineer for approval prior to starting surface preparation work.
2. Surface preparation work shall include cleaning for lines or cleaning for letters and symbols. Lines include broken line; dotted line; solid line; channelizing line; barrier lines; stop lines; crosswalk lines; and crossbars. When lines are installed, the area of preparation shall be at least the width of the new pavement marking, or existing line, plus 1 inch on each side. When letters and symbols are installed the area of preparation shall be sufficiently large to accommodate the new marking, or to remove the existing marking. Materials used for cleaning pavement of existing marking and any new spills, spatter, or overspray shall not damage the paved surface.

3. Whenever a marking area is cleaned by grinding, scraping, or sandblasting, the cleaning Work shall be conducted in such a manner that the finished pavement surface is not damaged or left in a pattern that will mislead or misdirect the motorist. When such cleaning Work is completed, the pavement surface shall be thoroughly blown-off with compressed air to remove residue and debris resulting from such Work.
4. On new concrete pavements, do not start cleaning operations until sufficient cure time has elapsed after the placement of concrete unless otherwise approved by the Engineer. Clean new concrete pavements by either sandblasting or water blasting. When water blasting is performed, apply pavement markings no sooner than 24 hours after the blasting has been completed. The extent of the blasting work shall be to clean and prepare the concrete surface such that:
 - a. There is no visible evidence of curing compound on the peaks of the textured concrete surface.
 - b. There are no heavy puddle deposits of curing compound in the valleys of the textured concrete surface.
 - c. All remaining curing compound is intact; all loose and flaking material is removed.
 - d. The peaks of the textured pavement surface are rounded in profile and free of sharp edges and irregularities.
5. Existing pavement markings shall be removed for the purpose of preparing the pavement surface for the application of new pavement markings in the same location as the existing markings, or to remove existing markings that are in good condition which, if allowed to remain, will interfere with or otherwise conflict with newly applied marking patterns as determined by the Engineer in his sole discretion. New pavement markings shall not be applied over existing markings unless approved by the Engineer.

C. Application

1. Install markings at the locations shown in the Contract Documents, in accordance with the manufacturer's installation instructions. Marking configurations shall be in accordance with the FHWA "Manual on Uniform Traffic Control Devices."
2. Provide application equipment as necessary for the job requirements. Equipment shall be capable of applying an unlined, pre-coated pressure sensitive adhesive pavement marking tape.
3. Apply pavement markings in the general direction of traffic. Striping against the direction of traffic flow will not be permitted.
4. Establish marking alignment points throughout the length of the marking area as approved by the Engineer.
5. Longitudinal lines shall be offset at least 2 inches from construction joints of Portland Cement Concrete pavements and joints or shoulder breaks of bituminous concrete pavements.

6. Repair or remove and reapply any pavement markings that fail to satisfy the requirements specified in this Section, at no additional cost to the Authority. Do not commence corrective work until after submitting repair method and obtaining Engineer's written approval.
7. The retro-reflective preformed marking film shall adhere to bituminous concrete and Portland Cement Concrete surfaces when applied according to the manufacturer's recommendations with minimum air and pavement temperatures of 50 degrees F and rising. A primer shall be applied to the roadway surface in strict compliance with manufacturer recommendations.
8. The roadway surface shall be dry at the time of marking application. Dirt, debris, loose particles and heavy oil residues shall be removed from the road surface application areas immediately prior to the installation of the preformed marking film.
9. Applied tape shall not be overlapped and only butt splices shall be used. Preformed marking film lines shall be placed with a mechanical applicator to produce lines which are neat, accurate and uniform without the use of heat, solvents or other additional adhesive means and shall be immediately ready for traffic after application.
10. Preformed marking film for symbols and legend shall be carefully laid and aligned using butt splices only.
11. Applied markings shall be immediately tamped in place with a rubber tire roller weighted at 200 pounds per inch of width minimum, or approved equal.
12. Continuously monitor, maintain and repair all installed pavement markings until issuance of the Certificate of Final Completion.

END OF SECTION

SECTION 02584C

PREFORMED REMOVABLE WET REFLECTIVE PAVEMENT MARKING TAPE APPENDIX A

SUBMITTALS

- A. Submit the following within 30 days of Contract award:

Product Data

Detailed catalog cuts and manufacturer's specifications of marking materials, wet reflective bonded core elements, reflective glass spheres, primer and test data demonstrating conformance to the requirements of this section.

- B. Bead Testing Procedure: Refractive index of beads by liquid immersion.

Equipment:

- Microscope (minimum 100X magnification)
- Light source-preferably sodium light or other monochromatic source, but not absolutely essential.
- Refractive index liquids. (R.P. Cargill Laboratories, Inc, Cedar Grove, NJ).
- Microscope slide and slide cover
- Mortar and pestle

Procedure:

- Using the mortar and pestle, crush a few representative beads and place a few of these crushed particles on a microscope slide.
- Place a drop of a refractive index liquid, with an index as close to that of the crushed particles as can be estimated, on the particles.
- Cover the slide with a microscope slide cover and view the crushed particles by transmitted light normal to the slide surface (illuminated from the bottom).
- Adjust the microscope mirror to allow a minimum light intensity for viewing. This is particularly important if sodium light is not used.
- Bring a relatively flat and transparent particle into focus by slightly raising and lowering the objective (microscope tube), look for one or both of the following:
 - Becke Line – This light line will appear to move either into the particle or away from it. In general, if the objective is lowered, the line will move toward the material of lower index.
 - Variation in Particle Brightness – When raising the objective from a sharp focus, the particle will appear to get brighter or darker than the surrounding field. If it becomes brighter, the particles have a higher refractive index than the liquid. If it becomes darker, the glass has a lower refractive index than the liquid. In both cases, the opposite will be true if the objectives lowered.
- This test can be used to confirm that the beads are above or below a specified index. It can also be used to give an accurate determination of the index (+ or – 0.001). This is done by using several refractive index liquids until a match or near

match of indices occurs. The index of the glass will equal that of the liquid when no becke line and now variation in bed brightness is observed.

The size and quality of the beads shall be such that the performance requirements for the retroreflective pliant polymer shall be met.

Acid Resistance: The beads shall show resistance to corrosion of their surface after exposure to a 1% solution (by weight) of sulfuric acid. The 1% acid solution shall be made by adding 5.7cc of concentrated acid into 1000cc of distilled water. CAUTION: Always add the concentrated acid into the water, not the reverse. The test shall be performed as follows:

Take a 1" x 2" sample, adhere it to the bottom of a glass tray and place just enough acid solution to completely immerse the sample. Cover the tray with a piece of glass to prevent evaporation and allow the sample to be exposed for 24 hours under these conditions. Then decant the acid solution (do not rinse, touch or otherwise disturb the bead surfaces) and dry the sample while adhered to the glass tray in a 150° F. (66° C.) oven for approximately 15 minutes.

Microscopic examination (20X) shall show no more than 15% of the beads having a formation of a very distinct opaque white (corroded) layer on their entire surface.

END OF APPENDIX "A"

SECTION 02584C

PREFORMED REMOVABLE WET REFLECTIVE PAVEMENT MARKING TAPE

INSTRUCTIONS TO SPECIFIER

A. Contract Drawings

Ensure that the Contract Drawings show the following items specified in the text:

Locations of existing pavement markings that are to be removed

Locations, patterns and dimensions of pavement markings

Widths and dimensions of reflectorized stripes

DIVISION 2**SECTION 02585C****PREFORMED THERMOPLASTIC PAVEMENT MARKINGS****PART 1 – GENERAL**

1.01 SUMMARY

- A. This section specifies preformed reflectorized pavement lines, symbols and letters to be furnished and installed at the locations and in accordance with the patterns indicated on Contract plans, or as directed by the Engineer.
- B. Apply preformed reflectorized pavement lines, symbols and letters on new and existing bituminous and Portland cement concrete pavement surfaces by hand and mechanical methods. The resultant marking shall be an adherent reflectorized marking that is capable of molding itself to the contours of the pavement surface and of resisting deformation by traffic.

1.02 REFERENCES

The following is a listing of the publications referenced in this Section.

American Association of State Highway Transportation Officials (AASHTO)

AASHTO M 247 Standard Specification for Glass Beads used in Pavement Markings

American Society for Testing and Materials (ASTM)

ASTM M 249 Thermoplastic Material
ASTM E 303 Method for Measuring Surface Frictional Properties using the
British Pendulum Tester
ASTM E 1710 Method for Measuring Nighttime Retroreflection

Federal Highway Administration (FHWA)

MUTCD Manual on Uniform Traffic Control Devices
DKT. # 99-6190 Color Specifications for Retroreflective Sign and Pavement Marking
Materials.

1.03 QUALITY ASSURANCE

Pavement marking size and shape shall be in accordance with the specifications provided by the Engineer.

A. Tolerances:

1. Width of lines: Minus zero, plus 1/8 inch.
2. Length of skip or lane lines and unpainted surface between the skip lines shall be plus or minus 3 inches.

3. Location of directional arrows, messages and stripes:
Within 2 inches of locations shown on the contract plans.
4. Size of letters and arrows: Plus or minus 2 inches.

1.04 DELIVERY, STORAGE AND HANDLING

All specified materials shall be handled in accordance with manufacturers recommendations.

1.05 SUBMITTALS

See "Appendix A" for submittal requirements

PART 2 – PRODUCTS

2.01 MATERIALS:

- A. General Requirement: The markings must be a resilient thermoplastic product with uniformly distributed glass beads throughout the entire cross sectional area. The markings must be resistant to the detrimental effects of motor fuels, lubricants, hydraulic fluids, etc. Lines, legends, and symbols must be capable of being affixed to bituminous and/or Portland cement concrete pavements by the use of the normal heat of a propane torch. Various colors shall be available as required.

The markings must be capable of conforming to pavement contours, breaks and faults through the action of traffic at normal pavement temperatures. The markings shall have resealing characteristics, such that the thermoplastic material is capable of fusing with itself and with previously applied thermoplastic when heated with the torch.

The markings must be able to be applied in temperatures down to 32°F without any special storage, preheating or treatment of the material before application.

- B. Manufacturing Control and ISO Certification: Verify that the manufacturer is ISO 9001:2008 certified and provide proof of current certification. The scope of the certification shall include manufacture of reflective highway markings.
- C. Physical Properties: Must be composed of an ester modified rosin resistant to degradation by motor fuels, lubricants, etc., in conjunction with aggregates, pigments, binders and glass beads which have been factory produced as a finished product, and must meet the requirements of the current edition of the Manual on Uniform Traffic Control Devices for Streets and Highways. The thermoplastic material must conform to AASHTO designation M 249, with the exception of the relevant differences due to the material being supplied in a preformed state.
- D. Graded Glass Beads:
 1. The material must contain a minimum of thirty percent (30%) intermixed graded glass beads by weight. The intermixed beads shall conform to AASHTO designation M 247, with minimum 80% true spheres and minimum refractive index of 1.50.
 2. The material must have factory applied coated surface beads in addition to the intermixed beads at a rate of 1 lb. (\pm 10%) per 10 sq. ft. These factory applied coated surface beads shall have a minimum of 90% true spheres, minimum refractive index of 1.50, and meet the following gradation:

Size Gradation		Retained %	Passing %
US Mesh	µm		
12	1700	0 - 2%	98 - 100%
14	1400	0 - 3.5%	96.5 - 100%
16	1180	2 - 25%	75 - 98%
18	1000	28 - 63%	37 - 72%
20	850	63 - 72%	28 - 37%
30	600	67 - 77%	23 - 33%
50	300	89 - 95%	5 - 11%
80	200	97-100%	0 - 3%

E. Pigments:

1. White: The material shall be manufactured with sufficient titanium dioxide pigment to meet FHWA Docket No. FHWA-99-6190 Table 5 and Table 6 as revised and corrected.
2. Red, Blue, and Yellow: The material shall be manufactured with sufficient pigment to meet FHWA Docket No. FHWA-99-6190 Table 5 and Table 6 as revised and corrected. The yellow pigments must be organic and must be heavy-metal free.
3. Other Colors: The pigments must be heavy-metal free.

F. Heating Indicators: The top surface of the material (same side as the factory applied surface beads) shall have regularly spaced indents. These indents shall act as a visual cue during application that the material has reached a molten state so satisfactory adhesion and proper bead embedment has been achieved and a post-application visual cue that the installation procedures have been followed.

G. Skid Resistance: The surface, with properly applied and embedded surface beads, must provide a minimum resistance value of 45 BPN when tested according to ASTM E 303.

H. Thickness: The material must be supplied at a minimum thickness of 125 mils.

I. Contrast Markings: When specified, Preformed Thermoplastic contrast markings shall be furnished and installed as follows:

1. Material thickness shall be a minimum of 125 mils
2. Border Contrast Marking: An integral non-reflective black contrasting perimeter border with a minimum width of 1.5 inch shall be furnished as specified for lines, symbols and letter markings.
3. Block Contrast Marking: The specified symbol or letter marking shall be embedded in an integral non-reflective black contrasting marking material.

J. Environmental Resistance: The material must be resistant to deterioration due to exposure to sunlight, water, salt or adverse weather conditions and must be impervious to oil and gasoline.

- K. Retroreflectivity: The material, when applied in accordance with manufacturer's guidelines, must demonstrate a uniform level of sufficient nighttime retroreflection when tested in accordance to ASTM E 1710. The applied material must have an initial minimum intensity reading of $500 \text{ mcd m}^{-2}\text{-lx}^{-1}$ for white and $300 \text{ mcd m}^{-2}\text{-lx}^{-1}$ for yellow as measured with an LTL-2000 or LTL-X Retroreflectometer.
- L. Packaging: The preformed thermoplastic markings shall be placed in protective plastic film with cardboard stiffeners where necessary to prevent damage in transit. Linear material must be cut to a maximum of 3 foot long pieces. Legends and symbols must also be supplied in flat pieces. The weight of the individual carton must not exceed 70 pounds. A protective film around the box must be applied in order to protect the material from rain and premature aging.

PART 3 – EXECUTION

3.01 INSTALLATION:

A. General

1. Apply pavement markings at the locations and in accordance with the patterns and dimensions shown on the Contract Drawings. Dimensional tolerances of markings shall be as specified in Section 1.03 of this specification.
2. The Engineer shall be notified 48 hours prior to the times when pavement marking and striping are scheduled to be performed.
3. When pavement markings are applied under traffic conditions, provide all necessary qualified personnel, and traffic control devices to maintain and protect traffic, and to protect marking operations and the new markings until thoroughly set. Perform short duration lane and work area closures in accordance with the requirements of "Maintenance of Traffic and Work Area Protection" of Division 1 – GENERAL PROVISIONS.
4. At the time of application, ensure that all pavement surfaces are dry, free of oil, dirt, dust, grease and similar foreign materials in accordance with manufacturer recommendations.
5. Apply markings in strict accordance with the manufacturer's installation instructions.

B. Cleaning and Preparation of Pavement Surfaces

1. Cleaning and surface preparation shall be confined to the surface area shown on the Contract Drawings for the application of pavement marking material and for the surface area of existing pavement markings that are shown on the Contract Drawings for removal. The planned means for cleaning, removing or obliterating existing or unsatisfactory markings shall be submitted to the Engineer for approval prior to starting surface preparation work.
2. Surface preparation work shall include cleaning for lines or cleaning for letters and symbols. Lines include broken line; dotted line; solid line; channelizing line; barrier lines; stop lines; crosswalk lines; and crossbars. When lines are installed, the area of preparation shall be at least the width of the new pavement marking, or existing line,

plus 1 inch on each side. When letters and symbols are installed the area of preparation shall be sufficiently large to accommodate the new marking, or to remove the existing marking. Materials used for cleaning pavement of existing marking and any new spills, spatter, or overspray shall not damage the paved surface.

3. Whenever a marking area is cleaned by grinding, scraping, or sandblasting, the cleaning Work shall be conducted in such a manner that the finished pavement surface is not damaged or left in a pattern that will mislead or misdirect the motorist. When such cleaning Work is completed, the pavement surface shall be thoroughly blown-off with compressed air to remove residue and debris resulting from such Work.
4. On new concrete pavements, do not start cleaning operations until sufficient cure time has elapsed after the placement of concrete unless otherwise approved by the Engineer. Clean new concrete pavements by either sandblasting or water blasting. When water blasting is performed, apply pavement markings no sooner than 24 hours after the blasting has been completed. The extent of the blasting work shall be to clean and prepare the concrete surface such that:
 - a. There is no visible evidence of curing compound on the peaks of the textured concrete surface.
 - b. There are no heavy puddle deposits of curing compound in the valleys of the textured concrete surface.
 - c. All remaining curing compound is intact; all loose and flaking material is removed.
 - d. The peaks of the textured pavement surface are rounded in profile and free of sharp edges and irregularities.
5. Existing pavement markings shall be removed for the purpose of preparing the pavement surface for the application of new pavement markings in the same location as the existing markings, or to remove existing markings that are in good condition which, if allowed to remain, will interfere with or otherwise conflict with newly applied marking patterns as determined by the Engineer in his sole discretion. New pavement markings shall not be applied over existing markings unless approved by the Engineer.

C. Application

1. Install markings at the locations shown in the Contract Documents, in accordance with the manufacturer's installation instructions. Marking configurations shall be in accordance with the FHWA "Manual on Uniform Traffic Control Devices."
2. Apply pavement markings in the general direction of traffic. Striping against the direction of traffic flow will not be permitted.
3. Establish marking alignment points throughout the length of the marking area as approved by the Engineer.
4. Longitudinal lines shall be offset at least 2 inches from construction joints of Portland Cement Concrete pavements and joints or shoulder breaks of bituminous concrete pavements.

5. Apply preformed pavement markings and furnish and install adhesives, as required, in accordance with manufacturers' recommendations.
6. Sealer Requirements: Sealer shall be applied, as required, in accordance with the preformed marking material manufacturer's recommendations. Sealer materials shall be placed at the application rate and by the application methods recommended by the manufacturer. When sealer is applied, the area of application shall be at least the width or dimension of the new preformed marking, plus 1 inch on each side.
7. Remove, to the satisfaction of the Engineer, preformed markings that are applied in error in areas that are not specified on the Contract plans.
8. Repair or remove and reapply any pavement markings that fail to satisfy the requirements specified in this Section, at no additional cost to the Authority. Do not commence corrective work until after submitting repair method and obtaining Engineer's written approval.
9. Asphalt Pavement: Apply materials using the propane torch method recommended by the manufacturer. The material must be able to be applied at ambient air and road temperatures down to 32°F without preheating of the pavement to a specific temperature. A compatible primer sealer shall be applied, in compliance with manufacturer recommendations, before installing block contrast markings on asphalt pavement to assure proper adhesion. Ensure that the pavement is clean, dry, and free of debris. Arrange for supplier to enclose application instructions with each box/package.
10. Portland Cement Concrete Pavement: The same application procedure shall be used as described under Section 3.01 C – 10 above, however, a compatible primer sealer shall be applied, in compliance with manufacturer recommendations, before installing the marking material on Portland Cement Concrete pavement to assure proper adhesion.
11. Mechanical Applying Equipment: Mechanical applying equipment for the placement of preformed pavement marking stripes shall be of the type recommended by the manufacturer of the preformed material. All applying equipment shall be approved by the Engineer prior to the start of work.

DIVISION 2
SECTION 02585C
PREFORMED THERMOPLASTIC PAVEMENT MARKINGS
APPENDIX "A"
SUBMITTALS

A. Submit the following within 30 days of Contract award:

Product Data

Detailed catalog cuts and manufacturer's specifications of marking materials

Detailed surface preparation and application procedures for bituminous concrete and Portland cement concrete.

Submit Manufacturer's material safety data sheets.

END OF APPENDIX "A"

SECTION 02585C
PREFORMED THERMOPLASTIC PAVEMENT MARKINGS
INSTRUCTIONS TO SPECIFIER

A. Contract Drawings

Ensure that the Contract Drawings show the following items specified in the text:

Location of existing pavement markings that are to be removed.

Locations, patterns, and dimensions of pavement markings.

Widths and dimensions of reflectorized stripes

END OF INSTRUCTIONS

DIVISION 2**SECTION 02587C****RAISED REFLECTORIZED SNOWPLOWABLE
PAVEMENT MARKERS****PART 1. GENERAL**

1.01 SUMMARY

- A. This Section specifies requirements for raised reflectORIZED snowplowable pavement markers, including removal of existing raised reflectORIZED snowplowable pavement markers and restoration of pavement areas disturbed by the removal operations.

1.02 REFERENCES

The following is a listing of the publications referenced in this Section:

American Association of State Highway and Transportation Officials (AASHTO)

AASHTO M 237 Specification for Epoxy Resin Adhesives for Bonding Traffic Markers to Hardened Portland Cement and Asphalt Concrete.

American Society for Testing and Materials (ASTM International)

ASTM C 33 Specification for Concrete Aggregates.

ASTM C 1602 Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.

ASTM D 3498 Specification for Adhesives for Field-Gluing Plywood to Lumber Framing for Floor Systems.

ASTM D 4383 Specification for Plowable, Raised Retroreflective Pavement Markers.

ASTM E 140 Hardness Conversion Tables for Metals Relationship Among Brinell Hardness, Vickers Hardness, Rockwell Hardness, Superficial Hardness, Knoop Hardness, and Scleroscope Hardness.

Federal Highway Administration (FHWA)

MUTCD Manual on Uniform Traffic Control Devices.

1.03 QUALITY ASSURANCE

- A. The installed snowplowable markers shall be warranted to the Authority, from the date of issuance of the Certificate of Final Completion, against material and installation defects for a period of one year.
- B. Obtain manufacturer's written certification that raised reflectORIZED snowplowable pavement markers and replacement retroreflectors meet the requirements of this Section.
- C. The manufacturer shall certify that the raised reflectORIZED snowplowable pavement marker meets the requirements of these Specifications.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Snowplowable reflectorized pavement marking materials shall be delivered to the construction site in strong, substantial containers that will protect the materials from handling damage.
- B. Store epoxy resin adhesive in a location protected from moisture and direct sunlight. Label containers of epoxy resin adhesive with the manufacturer's name, the product name, the date of manufacture and the shelf life.
- C. Containers of epoxy resin adhesive in storage shall be protected from moisture and direct sunlight and maintained at a temperature above 40° F.
- D. Containers of epoxy resin adhesive shall be labeled with the manufacturer's name, the product name, the date of manufacture, and the shelf life.

1.05 SUBMITTALS

See Appendix "A" for submittal requirements.

PART 2. PRODUCTS

2.01 MATERIALS

- A. General
 - 1. Raised reflectorized snowplowable pavement markers shall consist of a one-way or two-way plastic prismatic retroreflector (white, yellow, red, blue) that is mounted and firmly adhered to a snowplow resistant, durable iron casting. The raised reflectorized snowplowable pavement marker shall provide nighttime visibility in wet weather conditions and shall resist damage from snowplowing operations.
 - 2. Replacement retroreflectors (white, yellow, red, blue) for use with existing raised reflectorized snowplowable pavement markers, when installed, shall fit into the existing iron castings in which they are installed.
 - 3. Retroreflectors, replacement retroreflectors and iron castings shall be identified with the manufacturer's name and product name.
- B. Materials

Materials for raised reflectorized snowplowable pavement markers and for replacement retroreflectors shall comply with the following:

 - 1. Retroreflector
 - a. Retroreflectors (white, yellow, red, blue) shall be a prismatic type, molded of acrylic plastic, polycarbonate, or other suitable material which provides strength, abrasion resistance, impact resistance and resilience. The retroreflector shall be a transparent, ultraviolet stabilized grade material that resists color change over long periods of outdoor exposure.
 - b. The retroreflector shall contain one or two prismatic reflective face(s) to reflect incident light from one or two directions. The surface of the reflective face(s) shall be protected by a permanently bonded glass face or other transparent, abrasion resistant material.

- c. The minimum reflective surface area of each reflective face shall be 1.43 square inches.
- d. The initial minimum coefficient of luminous intensity (R_i) of each retroreflector shall be as shown in Table 1. Measurements shall be conducted in accordance with ASTM D 4383 or the following test procedure:

Locate the retroreflector with the center of the reflective face at a distance of 5 feet from a uniformly bright light source having an effective diameter of 0.2 inch. The return of light shall be measured using an annular ring photocell having a 0.37 inch I.D. by 0.47 inch O.D. The photocell shall be shielded to eliminate stray light. The distance from the light source center to the center of the photoactive area shall be 0.21 inch. If a test distance of other than 5 feet is used, the source and receiver dimensions and the distance between the source and receiver shall be modified in the same proportion as the test distance.

Table 1 - Coefficient of Luminous Intensity (R _i) Minimum Values (mcd/lx)					
Entrance Angle (degrees)	Observation Angle (degrees)	White	Yellow	Red	Blue
0	0.2	279	167	70	26
20	0.2	112	67	28	10

- e. When tested in accordance with ASTM D 4383, the coefficient of luminous intensity (R_i) of the retroreflective face(s), after abrasion and when measured in accordance with this Section, shall not be less than the values in Table 1.
 - f. When tested in accordance with ASTM D 4383, the lens impact strength of the prismatic retroreflector face(s) shall show no more than two radial cracks longer than 0.25 inch. There shall be no radial cracks extending to the edge of the abrasion resistant area. There shall be no delamination.
 - g. The retroreflector shall be laminated to an approximately 0.4 inch thick elastomeric pad, which shall absorb impact and permit attachment of the retroreflector to the raised reflectorized snowplowable pavement marker iron casting.
2. Iron Casting: Fabricate from ductile iron hardened to Rockwell Hardness 51-55 HRC, in accordance with ASTM E 140. The iron casting shall be configured so that the final installation height of the top of the iron casting is a maximum 0.3 inch above the pavement surface, and the leading edges of the iron casting are installed below the pavement surface. Iron castings with ramps shall have a maximum 4-1/2 degree ramp angle. The ramp angle is the angle formed by the pavement surface and a straight line drawn from the intersection of the ramp with the pavement surface to the top of the ramp.
 3. Epoxy Resin Adhesive: Adhesive for bonding the iron casting to the pavement surface shall be a two-component epoxy resin, meeting the requirements of AASHTO M 237 Type IV, or ASTM D 4383.
 4. Replacement Retroreflector Adhesive: Adhesive for bonding replacement retroreflectors to existing iron castings shall meet the requirements of ASTM D 3498, unless otherwise recommended by the manufacturer of the replacement retroreflector.

2.02 PAVEMENT PATCHING MATERIALS AT REMOVED SNOWPLOWABLE PAVEMENT MARKERS

- A. General: Remove existing plowable pavement markers where shown on the Contract Drawings, and repair the existing concrete or asphalt pavement as shown on the Contract Drawings.
- B. Pavement Patching Materials
Magnesium Phosphate Concrete (MPC)
 - 1. One-part MPC requiring only the addition of water shall be able to accept aggregate to extend the yield.
 - 2. The MPC shall have a minimum one hour compressive strength of 2,000 psi at 72 degrees F. The MPC shall be able to accept heated water and/or aggregate such that a three hour compressive strength of 2,000 psi can be attained at an ambient temperature of 36 degrees F.
 - 3. The MPC shall be a non-shrink material and shall exhibit minimal expansion such that cracks will not develop due to shrinkage or expansion over the full working range of ambient and component temperatures.
 - 4. Aggregates used to extend the yield shall meet requirements of ASTM C 33. The aggregate gradation and quantity shall be in accordance with the manufacturer's recommendations.
 - 5. Water used to mix the MPC shall conform to the requirements of ASTM C 1602.

Asphalt shall be as specified in Division 2 Section on asphalt concrete paving.

- C. Epoxy Resin Adhesive
 - 1. Epoxy resin adhesives shall be in strict accordance with the snowplowable pavement marker manufacturers' recommendations.

PART 3. EXECUTION

3.01 INSTALLATION

- A. General
 - 1. Locate and install all raised reflectorized snowplowable pavement markers and replacement retroreflectors as shown on the Contract Drawings and in accordance with the FHWA MUTCD.
 - 2. The Engineer shall be notified 48 hours prior to the times when snowplowable markers are scheduled for installation.
 - 3. When raised reflectorized snowplowable pavement markers and replacement retroreflectors are installed under traffic conditions, provide all necessary qualified personnel, and traffic control devices to maintain and protect traffic, and to protect snowplowable marker operations until the new markers are thoroughly set. Perform short duration lane and work area closures in accordance with the requirements of "Maintenance of Traffic and Work Area Protection" of Division 1 – GENERAL PROVISIONS

4. Install raised reflectorized snowplowable pavement markers and replacement retroreflectors in such a manner so as not to cause damage to the surrounding pavement. Repair damaged pavement surfaces that result from improper installation, or installation of raised reflectorized snowplowable pavement markers in unauthorized areas. Perform removal and repair work as directed by and to the satisfaction of the Engineer, at no additional cost to the Authority.
 5. The raised reflectorized snowplowable pavement marker shall be constructed so that the lower portion of the iron casting is below the pavement surface.
- B. Cleaning and Preparation of Pavement Surfaces
- Pavement Cutting and Cleaning
1. Cut the pavement to the dimensions and depth recommended by the manufacturer of the raised reflectorized snowplowable pavement marker. Conduct pavement cutting operations and pavement cleaning work in such a manner as to minimize airborne dust and similar debris in order to prevent being a hazard to workers, motor vehicle operation, or a nuisance to property owners. On newly installed Portland cement concrete pavements, pavement cutting operations shall not begin until a minimum of 30 days after placement of the concrete.
 2. Collect all debris resulting from the pavement cutting operation by vacuuming the pavement cut and adjacent pavement surface. Dispose of collected debris as uncontaminated solid waste or construction and demolition debris. Ensure that all operations associated with the handling, transporting and disposal of the construction and demolition debris are in compliance with all applicable Federal, State and local regulations.
- C. Installation of New Raised Reflectorized Snowplowable Pavement Markers
1. Install in accordance with the manufacturer's written instructions for installation, in accordance with this Section.
 2. Raised reflectorized snowplowable pavement markers installed in broken line patterns shall be placed in the gaps between the existing broken lines and in the same longitudinal alignment as the existing broken lines.
 3. Raised reflectorized snowplowable pavement markers installed in full or partial barrier line patterns shall be installed between the two existing full or partial barrier lines except that raised reflectorized snowplowable pavement markers shall not be installed across longitudinal or transverse pavement joints. If a longitudinal pavement joint exists between full or partial barrier lines, two raised reflectorized snowplowable pavement markers shall be placed opposite each other, located on the outside of and 2 inches away from each of the double yellow lines. A pavement joint shall be defined as either a sawed or formed joint in a concrete pavement that separates two pavement slabs or lanes, or as a construction (paving) joint or sawed and sealed joint in an asphalt pavement.

4. When possible, the edges of the raised reflectorized snowplowable pavement marker shall be located 4 to 6 inches away from pavement joints and cracks.
5. Raised reflectorized snowplowable pavement markers shall not be installed at locations that show visible evidence of pavement deterioration such as cracking and spalling. If the typical longitudinal spacing of the raised reflectorized snowplowable pavement marker falls at a location of pavement deterioration, relocate the raised reflectorized snowplowable pavement marker to another location as directed by the Engineer. In general, the distance that the raised reflectorized snowplowable pavement marker may be relocated away from the original location shall not exceed plus or minus 10 percent of the specified longitudinal spacing. If the raised reflectorized snowplowable pavement marker cannot be relocated within the plus or minus 10 percent tolerance, do not install the raised reflectorized snowplowable pavement marker.
6. Installation Procedure for Raised Reflectorized Snowplowable Pavement Markers:
 - a. Do not install raised reflectorized snowplowable pavement markers when the ambient or pavement temperatures are below 50 deg F.
 - b. At the time of installation, the cut pavement shall be clean, dry, and free of loose material. The minimum surface temperature of the iron casting shall be 50 deg F and surfaces of the iron casting shall be substantially free of scale, dirt, rust, oil, grease or any other contaminant which may reduce the bond between the iron casting and the epoxy adhesive. Clean iron castings that require removal of contaminants in accordance with the manufacturer's written recommendations and to the satisfaction of the Authority.
 - c. If necessary to facilitate installation of the epoxy resin adhesive, the two components (Part A and Part B) may be heated by indirect heat in accordance with the manufacturer's written recommendations. The minimum temperature of the epoxy resin adhesive shall be 50 deg F.
 - d. Proportion and mix the epoxy resin adhesive in accordance with the epoxy resin adhesive manufacturers written recommendations. Dispense the mixed epoxy resin adhesive into the pavement cut in such quantity that the cavity is filled with epoxy resin adhesive to within approximately 0.4 inch of the pavement surface.
 - e. Immediately place the raised reflectorized snowplowable pavement marker into the filled pavement cut. Extreme care shall be taken to ensure that the tabs located on the sides of the iron casting are in direct contact with the pavement surface, and the leading edges of the iron casting are below the pavement surface.
 - f. That portion of the iron casting installed in the pavement cavity shall be completely encased in the epoxy resin adhesive. Add additional epoxy adhesive as necessary so that the adhesive is approximately flush with the pavement surface. Do not allow excess epoxy to remain in front of the retroreflector or on the face of the retroreflector.
 - g. Protect the installed raised reflectorized snowplowable pavement marker from traffic until the epoxy resin adhesive has hardened to a condition that will not allow the iron casting to move.

D. Installation of Replacement Retroreflectors in Existing Raised Snowplowable Markers

1. Do not install replacement retroreflectors when the ambient temperature is less than 50 deg F, when the surface temperature of the iron casting is less than 50 deg F, when the iron casting is wet or during periods of rain.
2. Prior to installing replacement retroreflectors, remove existing retroreflectors and clean the existing iron castings. Retroreflectors that are removed from existing iron castings shall be collected and disposed of in a manner approved by the Authority. Remove all visible adhesive residue, salt, dirt, rust and other contaminants that are detrimental to the adhesion of the replacement retroreflector from the existing iron casting by either abrasive blasting, hand and power wire brushing, or by other methods approved by the Engineer. Surfaces of the iron casting shall be clean and dry at the time of installation of the replacement retroreflector and adhesive.
3. If present, remove the release paper or protective liner from the laminated elastomeric pad on the bottom of the retroreflector. If recommended by the manufacturer of the replacement retroreflector, apply adhesive (approximate 0.4 inch diameter bead) lengthwise to the center of the elastomeric pad or to the center of the iron-casting surface that will receive the retroreflector. Immediately install the replacement retroreflector into the iron casting and apply a minimum load of 100 pounds to the top of the retroreflector to seat and secure the replacement retroreflector.
4. Properly applied adhesive shall cover the entire contact area of the bottom of the retroreflector and a slight excess of adhesive will be evident around the edges of the retroreflector. Remove excess adhesive from the retroreflector face or excess build up of adhesive on the iron casting in front of the retroreflector face.

E. Removal of Existing Raised Snowplowable Pavement Markers

1. Sawcut the existing concrete or asphalt pavement 2 inches deep and 6 inches beyond the plowable pavement markers and chip or jackhammer the area to remove the plowable marker, epoxy and pavement to a uniform depth of the existing marker.
2. If the adjacent material is asphalt, clean and patch the area with asphalt pavement in accordance with Division 2 Section on asphalt concrete paving.
3. If the adjacent material is concrete, sandblast all surfaces clean with No. 40 boiler slag grit and No. 2 sandblast sand. Immediately prior to placing Magnesium Phosphate Concrete (MPC), clean the area to be patched of all loose material by vacuuming or air blasting, thoroughly wet down with water and remove all excess water by vacuuming or air blasting. When air blasting is used, it shall have a pressure of 100 psi (gauge) measured at the source. The Contractor shall at all times while sand blasting and/or air blasting, furnish and install protection by means of an approved screening to prevent damage to or interference with traffic in adjacent lanes.

- a. The MPC materials shall be mixed in a mortar-type mixer of such capacity that one batch will completely fill the area(s) to be patched. Hand mixing will not be allowed. Arrange for the mixer to be inspected and approved by the Engineer prior to use. Water shall be the first material added to the mixer. The quantity of water to be added shall be as recommended by the manufacturer. Use an approved measuring device to accurately measure the water. The second material added to the mixer shall be the aggregate, which shall be clean, sound and surface dry. The quantity shall be as recommended by the manufacturer and as approved by the Engineer. The last material to be added to the mixer shall be the MPC. The ingredients shall be heated when necessary to meet the strength requirements specified above. All materials shall be mixed for a minimum of three minutes or longer if required, to obtain a uniform mix.
- b. Prior to placing the MPC at a location contiguous to a pavement joint, forms shall be placed abutting the pavement edge and parallel to the joint, as necessary, to provide a straight edge for that side of the patch touching the joint, so that the patch will be flush with the vertical pavement edge, and so that a joint space to be sealed under the appropriate item(s) will be provided. The forms shall be coated with a material that is compatible with the MPC but will not adhere to it.
- c. Prior to placing the bulk of the MPC, a small amount shall be worked into the surface of the repair area with a stiff nylon broom to enhance bond. The MPC shall be placed in one lift and compacted. The MPC shall be hand screened and finished to meet the adjacent elevation, cross slopes and texture. After the MPC has set, it shall be cured in accordance with the manufacturer's instructions.
- d. The MPC shall reach a minimum compressive strength of 2,000 psi prior to allowing any vehicular traffic, so that all roadway lanes will be opened to traffic at the end of each workday.

END OF SECTION

SECTION 02587C

**RAISED REFLECTORIZED SNOWPLOWABLE
PAVEMENT MARKERS**

APPENDIX "A"

SUBMITTALS

Submit the following within 30 days of Contract award:

- A. Catalog Cuts
Submit detailed catalog cuts, manufacturer's specifications and test data of snowplowable pavement marker products demonstrating conformance to the requirements of this Section.
- B. Certificates
Submit manufacturer's written certification that raised reflectORIZED snowplowable pavement markers and adhesive for bonding replacement retroreflectors to existing iron castings meet requirements of this Section.

END OF APPENDIX "A"

SECTION 02587C

**RAISED REFLECTORIZED SNOWPLOWABLE
PAVEMENT MARKERS**

INSTRUCTIONS TO SPECIFIER

A. Contract Drawings

Ensure that the Contract Drawings show the following items specified in the text:

Locations, dimensions, type and color of raised snowplowable pavement markers.

Locations of snowplowable pavement marker removals

END OF INSTRUCTIONS

DIVISION 2**SECTION 02588C****TRAFFIC PAINT PAVEMENT MARKINGS
STANDARD AND WET REFLECTIVE
HIGH BUILD PAINT APPLICATIONS****PART 1. GENERAL**

1.01 SUMMARY

- A. This Section specifies requirements for Standard and Wet Reflective High Build traffic paint pavement markings.

1.02 REFERENCES

The following is a listing of the publications referenced in this Section:

American Association of State Highway and Transportation Officials (AASHTO)

AASHTO M 247 Specification for Glass Beads Used in Pavement Markings.

American Society for Testing and Materials (ASTM International)

ASTM D 522 Test Methods for Mandrel Bend Test of Attached Organic Coatings.

ASTM D 562 Test Method for Consistency of Paints Measuring Krebs Unit (KU) Viscosity Using a Stormer-Type Viscometer.

ASTM D 711 Test Method for No-Pick-Up Time of Traffic Paint.

ASTM D 868 Practice for Determination of Degree of Bleeding of Traffic Paint.

ASTM 1535 Practice for Specifying Color by the Munsell System

ASTM D1214 Test Method for Sieve Analysis of Glass Spheres

ASTM D 2369 Test Method for Volatile Content of Coatings.

ASTM D 2805 Test Method for Hiding Power of Paints by Reflectometry.

ASTM D 3723 Test Method for Pigment Content of Water-Emulsion Paints by Low-Temperature Ashing.

ASTM D 4060 Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.

ASTM E 1347 Test Method for Color and Color Difference Measurement by Tristimulus Colorimetry.

Federal Highway Administration (FHWA)

MUTCD Manual on Uniform Traffic Control Devices

U.S. GSA – Federal Standards

FED-STD-595C Federal Standard No.595C, Colors Used in Government Procurement

TT-P-1952 Paint, Traffic and Airfield Marking, Waterborne, Section 4.5.7

Color Reference
Munsell Book of Color

1.03 QUALITY ASSURANCE

- A. Environmental Requirements - Weather Limitations: Perform painting only when: the surface is dry, when the atmospheric temperature is above 50 degrees Fahrenheit (or is 45 degrees Fahrenheit and rising), the relative humidity does not exceed 85% . Paint shall not be applied if rain is expected within four hours after application or when the weather conditions are foggy or windy.
- B. Warranty: The completed marking installation, except for temporary markings, shall be warranted to the Authority, from the date of issuance of the Certificate of Final Completion, against peeling, chipping, flaking and delamination for a period of one year. Warranty shall grant the Authority a direct right of action against the manufacturer.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver paint to the construction site in sealed containers clearly marked with the date of manufacture, expiration date, name of manufacturer and VOC content.
- B. Store paint inside at normal room temperature.

1.05 SUBMITTALS

See Appendix "A" for submittal requirements.

PART 2. PRODUCTS

2.01 MANUFACTURERS

- A. Deliver no paint until the Engineer has pre-approved the paint manufacturer(s).

2.02 MATERIALS

- A. Paint
 1. The paint shall be a waterborne formulation manufactured for use as a pavement marking material from first grade raw materials and shall be free from defects and imperfections that might adversely affect the serviceability of the finished product. The materials shall show no hard settling or gelling upon storage in the sealed containers as delivered that will affect the performance of the product. The paint shall be furnished ready for use. Upon the Engineer's request, the Contractor shall take a one-quart sample of paint, seal the sample and mark it for future reference.
 2. Directional Reflectance: The directional reflectance of the white paint (without glass spheres) shall be 84 percent minimum and of the yellow paint shall be 54 percent minimum when tested in accordance with ASTM E 1347.
 3. Flexibility: The paint shall show no cracking, chipping or flaking when tested in accordance with ASTM D 522, Method B, when bent 180 degrees.
 4. Bleeding: The paint shall have a minimum bleed ratio of 0.95 when tested in accordance with ASTM D 868.

5. Viscosity: The consistency of the paint shall be not less than 75 or more than 95 Krebs Units at 77 degrees Fahrenheit, when tested in accordance with ASTM D 562.
6. Dry Opacity: Test the paint in accordance with ASTM D 2805. The minimum contrast ratio of the paint shall be: White 0.95, Yellow 0.92
7. Field Drying Time:
 - Standard Paint Application: Apply at 15 mils (plus or minus 1 mil) wet film thickness with Type I glass beads dropped on at the specified application rate. Paint shall dry to no pickup in under three minutes when tested by passing with a passenger car.
 - Wet Reflective High Build Paint Application: Apply at 20 mils (plus or minus 1 mil) wet film thickness with wet reflective bonded core elements and Type I glass beads dropped on at the specified application rates. Paint shall dry to no pickup in under five minutes when tested by passing with a passenger car.
 - The dry testing requirement shall be considered satisfied when a passenger car crossing the marking shows no visual deposition of the paint to the pavement surface when viewed from a distance of fifty feet.
8. Lab No Pickup: The paint dry time when tested in accordance with ASTM D 711 shall be not greater than 3 minutes.
9. Abrasion Resistance: Maximum weight loss of the paint film shall be 49 mg when tested in accordance with ASTM D 4060.
10. Shelf Life: The paint shall have a usable shelf life of not less than 12 months.[already in 1.05 B]
11. The paint shall contain less than 0.06 percent lead when tested in accordance with FS TT-P-1952, Section 4.3.1.1 and shall be chromium free when tested in accordance with FS TT-P-1952 Section 4.3.1.2.
12. Color:
 - For New Jersey traffic markings, the dried paint color shall match Fed. Std. 595B, Color Nos. White 37886 and Yellow 33538.
 - For New York traffic markings, white shall be an approximate visual color match to Munsell Book Notation N9.5/0 and yellow shall be an approximate visual match to Munsell Book Notation 10YR 8/14.
13. Non-Volatile Vehicle: The paint shall have a minimum non-volatile vehicle of 43.0 percent when tested in accordance with ASTM D 3723.
14. Pigment: The paint shall have a pigment content of 58.0 to 62.0 percent by weight when tested in accordance with ASTM D 3723.
15. Total Solids: The paint shall have a minimum solids content of 76 percent when tested in accordance with ASTM D 3723.
16. Volatile Organic Content (VOC): The VOC shall not exceed 150 g/L when tested in accordance with ASTM D 2369.
17. Paint shall be applied in strict accordance with the manufacturer's recommendations for use. In no case shall the paint be heated above 150 degrees.

- B. Glass Beads: Glass beads shall meet the requirements of AASHTO M 247, Type I and shall be required for drop-on application on Standard Paint Applications and on Wet Reflective High Build Paint Applications as the second bead drop. The beads shall be in accordance with the following requirements:
1. Composed of glass that is highly resistant to traffic wear and to the effects of weathering.
 2. Colorless, clean, transparent, free from milkiness or excessive air bubbles, and essentially free from surface scarring or scratching.
 3. Silica content: 60% minimum.
 4. Refractive index: 1.50 when tested by the liquid immersion method at 77°F.
 5. Show no tendency to absorb moisture in storage and shall remain free of clusters and hard lumps.
 6. Flow freely from the dispensing equipment at any time when surface and atmospheric conditions are satisfactory for painting.
 7. Spherical in shape – 70 percent minimum, true spheres
 8. Beads shall be treated with a moisture –resistant coating or a dual purpose type coating (moisture-resistant and adherence).
- C. Wet Reflective Bonded Core Elements (Wet Reflective High Build Paint Application only):

Bonded core elements shall be required for drop-on application on Wet Reflective High Build paint applications and shall conform to the following requirements:

1. Wet Reflective Bonded Core Elements - The bonded core reflective elements shall contain either clear or yellow tinted microcrystalline ceramic beads bonded to the opacified core. These elements shall not be manufactured using lead, chromate or arsenic.
2. Index of Refraction - All “dry-performing” microcrystalline ceramic beads bonded to the core shall have a minimum index of refraction of 1.70 when tested using the liquid oil immersion method. All “wet-performing” microcrystalline ceramic beads bonded to the core shall have a minimum index of refraction of 2.30 when tested using the liquid oil immersion method indicated in Appendix A.

Element Gradations		
Mass Percent Passing (ASTM D1214)		
US Mesh	Micron	“S” Series Elements
12	1700	85 - 100
14	1410	70 - 96
16	1180	50 - 90
18	1000	5 - 60
20	850	0 - 25
30	600	0 - 7

Surface Treatment – The bonded core elements shall be surface treated to optimize embedment and adhesion to the high build waterborne binder.

PART 3. EXECUTION

3.01 INSTALLATION

A. General

1. Apply painted pavement markings at the locations shown and in accordance with the patterns and dimensions shown on the Contract Drawings and in accordance with the FHWA "Manual on Uniform Traffic Control Devices".
2. Before any pavement marking Work is begun, submit a schedule of operations to the Engineer for approval.
3. When painted pavement markings are applied under traffic conditions, provide all necessary qualified personnel, flags, markers and signs to maintain and protect traffic, and to protect marking operations and the pavement markings until thoroughly set. Perform short duration lane and work area closures in accordance with the requirements of "Maintenance of Traffic and Work Area Protection" of Division 1 - GENERAL PROVISIONS.
4. Perform painting of pavement markings in the general direction of traffic. Applying pavement markings against the direction of traffic flow will not be permitted.
5. Remove all tracking marks, spilled paint and paint applied in unauthorized areas, to the satisfaction of the Engineer.
6. When necessary, establish marking alignment points at 25-foot intervals throughout the length of the marking area, or as otherwise approved by the Engineer.

B. Cleaning and Preparation of Pavement Surfaces

1. The exact limits for the removal of existing pavement markings shall be as shown on the Contract Drawings and as verified at the construction site and approved by the Engineer.
2. Conduct removal and cleaning work in such a manner as to minimize airborne dust and similar debris.
3. Contain, immediately collect and properly dispose of waste materials resulting from the removal of existing pavement markings. Use a high efficiency particulate air (HEPA) filter equipped vacuum attachment operated concurrently with the removal operations to collect waste materials unless other collection means are approved by the Engineer.
4. Do not wash wastes and residues resulting from the removal, surface cleaning and preparation operations into catch basins or the street storm drainage system.
5. Remove existing pavement markings no longer needed to the extent that 95 percent removal is achieved without the removal of more than 1/8 inch of pavement.
6. Prior to the start of removal operations, demonstrate the method of removal to the satisfaction of the Engineer. Any method that leaves gouges, ridges or grooves in the pavement will not be permitted.
7. Obliterating stripes by painting over them will not be permitted.

8. Immediately before application of the new marking material, the surface shall be dry and free from dirt, grease, oil, laitance or other foreign material that would reduce the bond between the marking material and the pavement. Clean the area to be painted by sweeping and mechanical or compressed air blowing as required to remove all dirt and loose materials. Areas which cannot be satisfactorily cleaned by brooming and mechanical or compressed air blowing, shall be scrubbed as directed with a water solution of trisodium phosphate (10 percent Na₃PO₄ by weight) or an approved equal solution. After scrubbing, rinse off the solution with water and dry the surface prior to painting.
9. Do not apply paint to Portland Cement Concrete pavement until the concrete in the areas to be painted is clean of curing material. Use abrasive blasting or high-pressure water to remove curing material from concrete surfaces.

C. Application

1. All equipment for the Work shall be as approved by the Engineer and shall include the apparatus necessary to properly clean the existing surface, a mechanical marking machine, and such auxiliary hand-painting equipment as may be necessary to satisfactorily complete the Work.
2. The mechanical marker shall be an atomizing spray-type marking machine suitable for application of traffic paint, at the specified application thickness, as well as placement of wet reflective bonded core elements (Wet Reflective Paint Applications only) and glass beads by double drop application (where required). It shall produce an even and uniform film thickness at the required coverage and shall be designed so as to apply markings of uniform cross sections and clear-cut edges without running or spattering and within the limits for straightness set forth herein. The machine shall have a gauge for measuring the quantity of paint used, graduated in gallons, or other approved measuring method. The equipment shall be truck mounted and capable of painting an 18-inch wide line in one pass.
3. Suitable adjustments shall be provided on the sprayer(s) of a single machine or by furnishing additional equipment for painting the width required
4. Mobile truck mounted applicators shall be capable of travelling at a uniform, predetermined speed over variable road grades to produce uniform application of striping material, following straight lines and making normal curves in a true arc. The equipment shall be capable of air-blasting the pavement, applying the stripe and immediately dropping the wet reflective bonded core elements (Wet Reflective Paint Applications only) and/or then glass beads in a single pass at speeds up to eight miles per hour.
5. Walk behind cart applicators shall be capable of uniform application of striping material at walking speeds, following straight lines and making tight turns symbols and legends. Mobile equipment must be available to air-blast the areas immediately prior to hand cart application. The walk behind cart shall be capable of applying the binder material and immediately dropping the wet reflective bonded core elements (Wet Reflective Paint Applications only) and/or then glass beads in a single pass at walking speeds.

6. The truck mounted and walk behind application equipment shall be capable of applying bonded core elements and glass beads to the surface of the pavement markings by double drop installation for Wet Reflective High Build paint applications. The wet reflective element dispenser for the first drop shall be attached to the striping machine in such a manner that the elements are dispensed closely behind the binder application device. The bead dispenser for the second drop shall be attached to the striping machine in such a manner that the beads are dispensed immediately after the first drop (bonded core elements).
7. The applicator for the wet reflective bonded core elements and glass beads shall be equipped with an automatic cut-off control that is synchronized with the cut-off of the binder material and shall be capable of delivering a uniform drop rate at required application speeds. Wet reflective bonded core elements and glass beads shall be applied such that they appear uniform on the entire traffic marking.
8. Layout pavement markings as shown on the Contract Drawings or, if not shown, as approved by the Engineer in advance of the paint application. Verify the locations, alignments and radii of all existing pavement markings prior to using them as a guide. Space control points at such intervals as will ensure accurate location and reproduction of all markings at the tolerances specified herein.
9. Apply markings at the locations and to the dimensions and spacing shown on the Contract Drawings. Do not apply paint until the layout and condition of the surface have been approved by the Engineer.
10. Mix paint in strict accordance with the manufacturer's instructions and apply to the pavement with a mechanical marker as follows:
 - Standard Paint Application: Wet film thickness of 15 mils
 - Wet Reflective High Build Paint Application: Wet film thickness of 20 mils
 - Temporary markings shall be placed at one half the thickness of Standard Paint markings. The addition of thinner will not be permitted.
11. Type I Glass beads shall be uniformly applied to Standard Paint Applications and Wet Reflective High Build Paint Applications at the rate of six pounds of beads per gallon of paint applied. Bonded core elements shall be uniformly applied to Wet Reflective High Build Paint Applications at the rate of 2.65 pounds per gallon of paint applied.
12. Allow a period of 30 days, for permanent markings, to elapse between placement of a bituminous surface course or seal coat and application of the paint. For periods less than 30 days, temporary markings shall be installed. The paint shall not bleed excessively, curl or discolor when applied to bituminous surfaces. The paint, when applied at the application rate specified herein, shall dry to no pick-up in under three minutes for a Standard 15 mil Paint Application and under five minutes for a 20 mil Wet Reflective High Build Paint Application.
13. Paint to achieve neat straight edges. The edges of the markings shall not vary from a straight line by more than 1/2 inch in 50 feet, and marking dimensions and spacings shall be within the following tolerances:

DIMENSION AND SPACING	TOLERANCE
36" or less	$\pm 1/2"$
>36" - 6'	$\pm 1"$
>6' - 60'	$\pm 2"$
>60'	$\pm 3"$

If the markings do not conform to these requirements, immediately obliterate and correct them as approved by the Engineer. Perform corrective work within the Work hours specified by the Engineer.

14. Distribute the glass beads to the surface of the marked areas immediately after application of the paint. Use a dispenser which is properly designed for attachment to the marking machine and suitable for dispensing glass spheres on Standard Paint Applications and glass beads plus wet reflective bonded core elements in a double drop application for Wet Reflective High Build Paint Applications.
15. Notify the Engineer upon arrival of each shipment of paint to the construction site. Return all emptied containers to the paint storage area for checking by the Engineer. Remove the containers from the construction site, but only after authorization by the Engineer. Maintain an accurate accounting of the paint materials used in the accepted Work.
16. Apply black paint as a 6-inch wide outline to increase contrast and visibility on concrete surfaces when specified.
17. Glass beads and bonded core elements shall not be applied to temporary markings or black paint installations.
18. After application of the paint, protect all markings from damage until the paint is dry. Erect or place suitable warning signs, flags or barricades, protective screens or coverings, as required. Protect all surfaces from excess moisture and rain, and from disfiguration by spatter, splashes, spillage and drippings of paint.
19. Defective Workmanship or Materials: When any material not conforming to the requirements of this Section or the Contract Drawings has been delivered to the construction site but not yet installed, or has been incorporated in the Work and has been found to be of inferior quality as determined by the Engineer, such material or Work will be considered defective and shall be removed as directed by the Engineer and replaced, at no additional cost to the Authority.

END OF SECTION

SECTION 02588C
TRAFFIC PAINT PAVEMENT MARKINGS
STANDARD AND WET REFLECTIVE
HIGH BUILD PAINT APPLICATIONS

APPENDIX "A"
SUBMITTALS

- A. Submit the following within 30 days of Contract award:

Product Data

Detailed catalog cuts and manufacturer's specifications of marking materials, wet reflective bonded core elements, reflective glass spheres, primer and test data demonstrating conformance to the requirements of this section.

- B. Bead Testing Procedure: Refractive index of beads by liquid immersion.

Equipment:

- Microscope (minimum 100X magnification)
- Light source-preferably sodium light or other monochromatic source, but not absolutely essential.
- Refractive index liquids. (R.P. Cargill Laboratories, Inc, Cedar Grove, NJ).
- Microscope slide and slide cover
- Mortar and pestle

Procedure:

- Using the mortar and pestle, crush a few representative beads and place a few of these crushed particles on a microscope slide.
- Place a drop of a refractive index liquid, with an index as close to that of the crushed particles as can be estimated, on the particles.
- Cover the slide with a microscope slide cover and view the crushed particles by transmitted light normal to the slide surface (illuminated from the bottom).
- Adjust the microscope mirror to allow a minimum light intensity for viewing. This is particularly important if sodium light is not used.
- Bring a relatively flat and transparent particle into focus by slightly raising and lowering the objective (microscope tube), look for one or both of the following:
 - Becke Line – This light line will appear to move either into the particle or away from it. In general, if the objective is lowered, the line will move toward the material of lower index.
 - Variation in Particle Brightness – When raising the objective from a sharp focus, the particle will appear to get brighter or darker than the surrounding field. If it becomes brighter, the particles have a higher refractive index than the liquid. If it becomes darker, the glass has a lower refractive index than the liquid. In both cases, the opposite will be true if the objectives lowered.
- This test can be used to confirm that the beads are above or below a specified index. It can also be used to give an accurate determination of the index (+ or – 0.001). This is done by using several refractive index liquids until a match or near match of

indices occurs. The index of the glass will equal that of the liquid when no becke line and now variation in bed brightness is observed.

- The size and quality of the beads shall be such that the performance requirements for the retroreflective pliant polymer shall be met.
-
- Acid Resistance: The beads shall show resistance to corrosion of their surface after exposure to a 1% solution (by weight) of sulfuric acid. The 1% acid solution shall be made by adding 5.7cc of concentrated acid into 1000cc of distilled water. CAUTION: Always add the concentrated acid into the water, not the reverse. The test shall be performed as follows:
 -
 - Take a 1" x 2" sample, adhere it to the bottom of a glass tray and place just enough acid solution to completely immerse the sample. Cover the tray with a piece of glass to prevent evaporation and allow the sample to be exposed for 24 hours under these conditions. Then decant the acid solution (do not rinse, touch or otherwise disturb the bead surfaces) and dry the sample while adhered to the glass tray in a 150° F. (66° C.) oven for approximately 15 minutes.
 -
- Microscopic examination (20X) shall show no more than 15% of the beads having a formation of a very distinct opaque white (corroded) layer on their entire surface.

END OF APPENDIX "A"

SECTION 02588C

TRAFFIC PAINT PAVEMENT MARKINGS STANDARD AND WET REFLECTIVE HIGH BUILD PAINT APPLICATIONS

INSTRUCTIONS TO SPECIFIER

A. Contract Drawings

Ensure that the Contract Drawings show the following items specified in the text:

Locations of existing pavement markings that are to be removed

Locations, patterns and dimensions of pavement markings.

Provide additional requirements for proper disposal of removal residues if applicable.

Pavement marking type:

Standard Paint Application (15 mil)

Wet Reflective High Build Paint Application (20 mil)

Temporary Paint Marking

Black Contrast Marking.

END OF INSTRUCTIONS

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STANDARD CONTRACT TERMS AND CONDITIONS

PART I GENERAL DEFINITIONS

To avoid undue repetition, the following terms, as used in this Agreement, shall be construed as follows:

Authority or Port Authority - shall mean the Port Authority of New York and New Jersey.

Contract, Document or Agreement - shall mean the writings setting forth the scope, terms, conditions and Specifications for the procurement of Goods and/or Services, as defined hereunder and shall include, but not be limited to: Invitation for Bid (IFB), Request for Quotation (RFQ), Request for Proposal (RFP), Purchase Order (PO), Cover Sheet, executed Signature Sheet, AND PRICING SHEETS with Contract prices inserted," "STANDARD CONTRACT TERMS AND CONDITIONS," and, if included, attachments, endorsements, schedules, exhibits, or drawings, the Authority's acceptance and any written addenda issued over the name of the Assistant Director, Commodities and Services Division, Procurement Department..

Days or Calendar Days - shall mean consecutive calendar days, Saturdays, Sundays, and holidays, included.

Week - unless otherwise specified, shall mean seven (7) consecutive calendar days, Saturdays, Sundays, and holidays.

Month - unless otherwise specified, shall mean a calendar month.

Director - shall mean the Director of the Department which operates the facility of the Port Authority at which the services hereunder are to be performed, for the time being, or his/her successor in duties for the purpose of this Contract, or one of his/her authorized representatives for the purpose of this Contract.

Manager - shall mean the Manager of the Facility for the time being, or his successor in duties for the purpose of this Contract, or his duly authorized representative for the purpose of this Contract.

No person shall be deemed a representative of the Director or Manager except to the extent specifically authorized in an express written notice to the Contractor signed by the Director or Manager, as the case may be. Further, no person shall be deemed a successor in duties of the Director unless the Contractor is so notified in writing signed by the Assistant Director, Commodities & Services Division, Procurement Department. No person shall be deemed a successor in duties of the Manager unless the Contractor is so notified in a writing signed by the Director.

Minority Business Enterprise (MBE) - shall mean a business entity which is at least 51% owned and controlled by one or more members of one or more minority groups, or, in the case of a publicly held corporation, at least 51% of the stock of which is owned by one or more minority groups, and whose management and daily business operations are controlled by one or more such individuals who are citizens or permanent resident aliens.

"Minority Group" means any of the following racial or ethnic groups:

- (a) Black persons having origins in any of the Black African racial groups not of Hispanic origin;
- (b) Hispanic persons of Mexican, Puerto Rican, Dominican, Cuban, Central or South American culture or origin, regardless of race;
- (c) Asian and Pacific Islander persons having origins in any of the original peoples of the Far East, Southeast Asia, The Indian Subcontinent, or the Pacific Islands;

- (d) Native American or Alaskan native persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification.

Site of the Work - or words of similar import shall mean the Facility and all buildings and properties associated therewith as described in this Contract.

Small Business Enterprise (SBE) - The criteria for a Small Business Enterprise are:

- o The principal place of business must be located in New York or New Jersey;
- o The firm must have been in business for at least three years with activity;
- o Average gross income limitations by industry as established by the Port Authority.

Subcontractor - shall mean anyone who performs work (other than or in addition to the furnishing of materials, plant or equipment) in connection with the services to be provided hereunder, directly or indirectly for or on behalf of the Contractor (and whether or not in privity of contract with the Contractor), but shall not include any person who furnished merely his own personal labor or his own personal services. "Subcontractor", however, shall exclude the Contractor or any subsidiary or parent of the Contractor or any person, firm or corporation which has a substantial interest in the Contractor or in which the Contractor or the parent or the subsidiary of the Contractor, or an officer or principal of the Contractor or of the parent of the subsidiary of the Contractor has a substantial interest, provided, however, that for the purpose of the clause hereof entitled "Assignments and Subcontracts" the exclusion in this paragraph shall not apply to anyone but the Contractor itself.

Women-Owned Business Enterprise (WBE) - shall mean a business enterprise which is at least 51% owned by one or more women, or, in the case of a publicly held corporation, at least 51% of the stock of which is owned by one or more women and whose management and daily business operations are controlled by one or more women who are citizens or permanent or resident aliens.

Work - shall mean all services, equipment and materials (including materials and equipment, if any, furnished by the Authority) and other facilities and all other things necessary or proper for, or incidental to the services to be performed or goods to be furnished in connection with the service to be provided hereunder.

PART II GENERAL PROVISIONS

1. Facility Rules and Regulations of The Port Authority

- a. The Contractor shall observe and obey (and compel its officers, employees, guests, invitees, and those doing business with it, to observe and obey) the facility Rules and Regulations of the Port Authority now in effect, and such further reasonable Rules and Regulations which may from time to time during the term of this Agreement be promulgated by the Port Authority for reasons of safety, health, preservation of property or maintenance of a good and orderly appearance and efficient operation of the Facility. The Port Authority agrees that, except in case of emergency, it shall give notice to the Contractor of every Rule and Regulation hereafter adopted by it at least five days before the Contractor shall be required to comply therewith.
- b. A copy of the facility Rules and Regulations of the Port Authority shall be available for review by the Contractor at the Office of the Secretary of the Port Authority.

2. Contractor Not An Agent

This Agreement does not constitute the Contractor the agent or representative of the Port Authority for any purpose whatsoever except as may be specifically provided in this Agreement. It is hereby specifically acknowledged and understood that the Contractor, in performing its services hereunder, is and shall be at all

times an independent Contractor and the officers, agents and employees of the Contractor shall not be or be deemed to be agents, servants or employees of the Port Authority.

3. Contractor's Warranties

The Contractor represents and warrants:

- a. That it is financially solvent, that it is experienced in and competent to perform the requirements of this Contract, that the facts stated or shown in any papers submitted or referred to in connection with the solicitation are true, and, if the Contractor be a corporation, that it is authorized to perform this Contract;
- b. That it has carefully examined and analyzed the provisions and requirements of this Contract, and that from its own investigations it has satisfied itself as to the nature of all things needed for the performance of this Contract, the general and local conditions and all other matters which in any way affect this Contract or its performance, and that the time available to it for such examination, analysis, inspection and investigation was adequate;
- c. That the Contract is feasible of performance in accordance with all its provisions and requirements and that it can and will perform it in strict accordance with such provisions and requirements;
- d. That no Commissioner, officer, agent or employee of the Port Authority is personally interested directly or indirectly in this Contract or the compensation to be paid hereunder;
- e. That, except only for those representations, statements or promises expressly contained in this Contract, no representation, statement or promise, oral or in writing, of any kind whatsoever by the Port Authority, its Commissioners, officers, agents, employees or consultants has induced the Contractor to enter into this Contract or has been relied upon by the Contractor, including any with reference to: (1) the meaning, correctness, suitability, or completeness of any provisions or requirements of this Contract; (2) the nature, quantity, quality or size of the materials, equipment, labor and other facilities needed for the performance of this Contract; (3) the general or local conditions which may in any way affect this Contract or its performance; (4) the price of the Contract; or (5) any other matters, whether similar to or different from those referred to in (1) through (4) immediately above, affecting or having any connection with this Contract, the bidding thereon, any discussions thereof, the performance thereof or those employed therein or connected or concerned therewith.

Moreover, the Contractor accepts the conditions at the Site of the Work as they may eventually be found to exist and warrants and represents that it can and will perform the Contract under such conditions and that all materials, equipment, labor and other facilities required because of any unforeseen conditions (physical or otherwise) shall be wholly at its own cost and expense, anything in this Contract to the contrary notwithstanding.

Nothing in the Specifications or any other part of the Contract is intended as or shall constitute a representation by the Port Authority as to the feasibility of performance of this Contract or any part thereof.

The Contractor further represents and warrants that it was given ample opportunity and time and by means of this paragraph was requested by the Port Authority to review thoroughly all documents forming this Contract prior to opening of Bids on this Contract in order that it might request inclusion in this Contract of any statement, representation, promise or provision which it desired or on which it wished to place reliance; that it did so review said documents, that either every such statement, representation, promise or provision has been included in this Contract or else, if omitted, that it expressly relinquishes the benefit of any such omitted statement, representation, promise or provision and is willing to perform this Contract without claiming reliance thereon or making any other claim on account of such omission.

The Contractor further recognizes that the provisions of this numbered clause (though not only such provisions) are essential to the Port Authority's consent to enter into this Contract and that without such provisions, the Authority would not have entered into this Contract.

4. Personal Non-Liability

Neither the Commissioners of the Port Authority nor any of them, nor any officer, agent or employee thereof, shall be charged personally by the Contractor with any liability, or held personally liable to the Contractor under any term or provision of this Agreement, or because of its execution or attempted execution, or because of any breach, or attempted or alleged breach, thereof.

5. Equal Employment Opportunity, Affirmative Action, Non-Discrimination

- a. The Contractor is advised to ascertain and comply with all applicable federal, State and local statutes, ordinances, rules and regulations and, federal Executive Orders, pertaining to equal employment opportunity, affirmative action, and non-discrimination in employment.
- b. Without limiting the generality of any other term or provision of this Contract, in the event of the Contractor's non-compliance with the equal opportunity and non-discrimination clause of this Contract, or with any of such statutes, ordinances, rules, regulations or Orders, this Contract may be cancelled, terminated or suspended in whole or in part.

6. Rights and Remedies of the Port Authority

The Port Authority shall have the following rights in the event the Contractor is deemed guilty of a breach of any term whatsoever of this Contract:

- a. The right to take over and complete the Work or any part thereof as agent for and at the expense of the Contractor, either directly or through others.
- b. The right to cancel this Contract as to any or all of the Work yet to be performed.
- c. The right to specific performance, an injunction or any appropriate equitable remedy.
- d. The right to money damages.

For the purpose of this Contract, breach shall include but not be limited to the following, whether or not the time has yet arrived for performance of an obligation under this Contract: a statement by the Contractor to any representative of the Port Authority indicating that the Contractor cannot or will not perform any one or more of its obligations under this Contract; any act or omission of the Contractor or any other occurrence which makes it improbable at the time that it will be able to perform any one or more of its obligations under this Contract; any suspension of or failure to proceed with any part of the Work by the Contractor which makes it improbable at the time that it will be able to perform any one or more of its obligations under this Contract.

The enumeration in this numbered clause or elsewhere in this Contract of specific rights and remedies of the Port Authority shall not be deemed to limit any other rights or remedies which the Authority would have in the absence of such enumeration; and no exercise by the Authority of any right or remedy shall operate as a waiver of any other of its rights or remedies not inconsistent therewith or to estop it from exercising such other rights or remedies.

7. Rights and Remedies of the Contractor

Inasmuch as the Contractor can be adequately compensated by money damages for any breach of this Contract which may be committed by the Port Authority, the Contractor expressly agrees that no default, act or omission of the Port Authority shall constitute a material breach of this Contract, entitling the Contractor to cancel or rescind this Contract or to suspend or abandon performance.

8. Submission To Jurisdiction

The Contractor hereby irrevocably submits itself to the jurisdiction of the Courts of the State of New York and New Jersey, in regard to any controversy arising out of, connected with, or in any way concerning this Contract.

The Contractor agrees that the service of process on the Contractor in relation to such jurisdiction may be made, at the option of the Port Authority, either by registered or certified mail addressed to it at the address

of the Contractor indicated on the signature sheet, or by actual personal delivery to the Contractor, if the Contractor is an individual, to any partner if the Contractor be a partnership or to any officer, director or managing or general agent if the Contractor be a corporation.

Such service shall be deemed to be sufficient when jurisdiction would not lie because of the lack of basis to serve process in the manner otherwise provided by law. In any case, however, process may be served as stated above whether or not it might otherwise have been served in a different manner.

9. Harmony

- a. The Contractor shall not employ any persons or use any labor, or use or have any equipment, or permit any condition to exist which shall or may cause or be conducive to any labor complaints, troubles, disputes or controversies at the Facility which interfere or are likely to interfere with the operation of the Port Authority or with the operations of lessees, licensees or other users of the Facility or with the operations of the Contractor under this Contract.

The Contractor shall immediately give notice to the Port Authority (to be followed by written notices and reports) of any and all impending or existing labor complaints, troubles, disputes or controversies and the progress thereof. The Contractor shall use its best efforts to resolve any such complaint, trouble, dispute or controversy. If any type of strike, boycott, picketing, work stoppage, slowdown or other labor activity is directed against the Contractor at the Facility or against any operations of the Contractor under this Contract, whether or not caused by the employees of the Contractor, and if any of the foregoing, in the opinion of the Port Authority, results or is likely to result in any curtailment or diminution of the services to be performed hereunder or to interfere with or affect the operations of the Port Authority, or to interfere with or affect the operations of lessees, licensees, or other users of the Facility or in the event of any other cessation or stoppage of operations by the Contractor hereunder for any reason whatsoever, the Port Authority shall have the right at any time during the continuance thereof to suspend the operations of the Contractor under this Contract, and during the period of the suspension the Contractor shall not perform its services hereunder and the Port Authority shall have the right during said period to itself or by any third person or persons selected by it to perform said services of the Contractor using the equipment which is used by the Contractor in its operations hereunder as the Port Authority deems necessary and without cost to the Port Authority. During such time of suspension, the Contractor shall not be entitled to any compensation. Any flat fees, including management fees, shall be prorated. Prior to the exercise of such right by the Port Authority, it shall give the Contractor notice thereof, which notice may be oral. No exercise by the Port Authority of the rights granted to it in the above subparagraph shall be or be deemed to be a waiver of any rights of termination or revocation contained in this Contract or a waiver of any rights or remedies which may be available to the Port Authority under this Contract or otherwise.

- b. During the time that the Contractor is performing the Contract, other persons may be engaged in other operations on or about the worksite including Facility operations, pedestrian, bus and vehicular traffic and other Contractors performing at the worksite, all of which shall remain uninterrupted.

The Contractor shall so plan and conduct its operations as to work in harmony with others engaged at the site and not to delay, endanger or interfere with the operation of others (whether or not specifically mentioned above), all to the best interests of the Port Authority and the public as may be directed by the Port Authority.

10. Claims of Third Persons

The Contractor undertakes to pay all claims lawfully made against it by subcontractors, suppliers and workers, and all claims lawfully made against it by other third persons arising out of or in connection with or because of the performance of this Contract and to cause all subcontractors to pay all such claims

lawfully made against them.

11. No Third Party Rights

Nothing contained in this Contract is intended for the benefit of third persons, except to the extent that the Contract specifically provides otherwise by use of the words "benefit" or "direct right of action."

12. Provisions of Law Deemed Inserted

Each and every provision of law and clause required by law to be inserted in this Contract shall be deemed to be inserted herein and the Contract shall be read and enforced as though it were included therein, and if through mistake or otherwise any such provision is not inserted, or is not correctly inserted, then upon the application of either party, the Contract shall forthwith be physically amended to make such insertion.

13. Costs Assumed By The Contractor

It is expressly understood and agreed that all costs of the Contractor of whatever kind or nature and whether imposed directly upon the Contractor under the terms and provisions hereof or in any other manner whatsoever because of the requirements of the operation of the service or otherwise under this Agreement shall be borne by the Contractor or without compensation or reimbursement from the Port Authority, except as specifically set forth in this Agreement. The entire and complete cost and expense of the Contractor's services and operations hereunder shall be borne solely by the Contractor and under no circumstances shall the Port Authority be liable to any third party (including the Contractor's employees) for any such costs and expenses incurred by the Contractor and under no circumstances shall the Port Authority be liable to the Contractor for the same, except as specifically set forth in this Section.

14. Default, Revocation or Suspension of Contract

a. If one or more of the following events shall occur:

1. If fire or other cause shall destroy all or a substantial part of the Facility.
2. If any governmental agency shall condemn or take a temporary or permanent interest in all or a substantial part of the Facility, or all of a part of the Port Authority's interest herein;

then upon the occurrence of such event or at any time thereafter during the continuance thereof, the Port Authority shall have the right on twenty-four (24) hours written notice to the Contractor to revoke this Contract, such revocation to be effective upon the date and time specified in such notice.

In such event this Contract shall cease and expire on the effective date of revocation as if said date were the date of the expiration of this Contract. Such revocation shall not, however, relieve the Contractor of any liabilities or obligations hereunder which shall have accrued on or prior to the effective date of revocation.

b. If one or more of the following events shall occur:

1. The Contractor shall become insolvent, or shall take the benefit of any present or future insolvency statute, or shall make a general assignment for the benefit of creditors, or file a voluntary petition in bankruptcy or a petition or answer seeking an arrangement or its reorganization or the readjustment of its indebtedness under the federal bankruptcy laws or under any other law or statute of the United States or of any State thereof, or consent to the appointment of a receiver, trustee, or liquidator of all or substantially all its property; or
2. By order or decree of a court the Contractor shall be adjudged bankrupt or an order shall be made approving a petition filed by any of the creditors, or, if the Contractor is a corporation, by any of the stockholders of the Contractor, seeking its reorganization or the readjustment of

its indebtedness under the federal bankruptcy laws or under any law or statute of the United States or of any State thereof; or

3. A petition under any part of the federal bankruptcy laws or an action under any present or future insolvency law or statute shall be filed against the Contractor and shall not be dismissed within thirty (30) days after the filing thereof; or
4. The interest of the Contractor under this Contract shall be transferred to, passed to or devolve upon, by operation of law or otherwise, any other person, firm or corporation, or
5. The Contractor, if a corporation, shall, without the prior written approval of the Port Authority, become a surviving or merged corporation in a merger, a constituent corporation in a consolidation, or a corporation in dissolution; or
6. If the Contractor is a partnership, and the said partnership shall be dissolved as the result of any act or omission of its copartners or any of them, or by operation of law or the order or decree of any court having jurisdiction, or for any other reason whatsoever; or
7. By or pursuant to, or under authority of any legislative act, resolution or rule, or any order or decree of any court or governmental board, agency or officer having jurisdiction, a receiver, trustee, or liquidator shall take possession or control of all or substantially all of the property of the Contractor and such possession or control of all or substantially all of the property of the Contractor and shall continue in effect for a period of fifteen (15) days;

then upon the occurrence of any such event or at any time thereafter during the continuance thereof, the Port Authority shall have the right upon five (5) days notice to the Contractor to terminate this Contract and the rights of the Contractor hereunder; termination to be effective upon the date and time specified in such notice as if said date were the date of the expiration of this Contract. Termination shall not relieve the Contractor of any liabilities or obligations hereunder which have accrued on or prior to the effective date of termination.

c. If any of the following shall occur:

1. The Contractor shall cease, abandon any part of the service, desert, stop or discontinue its services in the premises for any reason whatsoever and regardless of the fault of the Contractor; or
2. The Contractor shall fail to keep, perform and observe each and every other promise, covenant and agreement set forth in this Contract on its part to be kept, performed or observed, within five (5) days after receipt of notice of default thereunder from the Port Authority (except where fulfillment of its obligations requires activity over a greater period of time, and the Contractor shall have commenced to perform whatever may be required for fulfillment within five (5) days after receipt of notice and continues such performance without interruption except for causes beyond its control);

then upon the occurrence of any such event or during the continuance thereof, the Port Authority shall have the right on twenty four (24) hours notice to the Contractor to terminate this Contract and the rights of the Contractor hereunder, termination to be effective upon the date and time specified in such notice. Termination shall not relieve the Contractor of any liabilities which shall have accrued on or prior to the effective date of termination.

d. If any of the events enumerated in this Section shall occur prior to commencement date of this Contract the Port Authority upon the occurrence of any such event or any time thereafter during the continuance thereof by twenty-four (24) hours notice may terminate or suspend this Contract and the rights of the Contractor hereunder, such termination or suspension to be effective upon the date specified in such notice.

e. No payment by the Port Authority of any monies to the Contractor for any period or periods after

default of any of the terms, covenants or conditions hereof to be performed, kept and observed by the Contractor and no act or thing done or omitted to be done by the Port Authority shall be deemed to be a waiver of the right of the Port Authority to terminate this Contract or of any other right or remedies to which the Port Authority may be entitled because of any breach thereof. No waiver by the Port Authority of any default on the part of the Contractor in the performance of any of the terms, covenants and conditions hereof to be performed, kept or observed by the Contractor shall be or be construed to be a waiver by the Port Authority of any other subsequent default in the performance of any of the said terms, covenants and conditions.

- f. In addition to all other rights of revocation or termination hereunder and notwithstanding any other provision of this Contract the Port Authority may terminate this Contract and the rights of the Contractor hereunder without cause at any time upon five (5) days written notice to the Contractor and in such event this Contract shall cease and expire on the date set forth in the notice of termination as fully and completely as though such dates were the original expiration date hereof and if such effective date of termination is other than the last day of the month, the amount of the compensation due to the Contractor from the Port Authority shall be prorated when applicable on a daily basis. Such cancellation shall be without prejudice to the rights and obligations of the parties arising out of portions already performed but no allowance shall be made for anticipated profits.
- g. Any right of termination contained in this paragraph, shall be in addition to and not in lieu of any and all rights and remedies that the Port Authority shall have at law or in equity consequent upon the Contractor's breach of this Contract and shall be without prejudice to any and all such other rights and remedies. It is hereby specifically agreed and understood that the exercise by the Port Authority of any right of termination set forth in this paragraph shall not be or be deemed to be an exercise by the Port Authority of an election of remedies so as to preclude the Port Authority from any right to money damages it may have for the period prior to the effective date of termination to the original expiration date of the Contract, and this provision shall be deemed to survive the termination of this Contract as aforesaid.
- h. If (1) the Contractor fails to perform any of its obligations under this Contract or any other agreement between the Port Authority and the Contractor (including its obligation to the Port Authority to pay any claim lawfully made against it by any supplier, subcontractor or worker or other person which arises out of or in connection with the performance of this Contract or any other agreement with the Port Authority) or (2) any claim (just or unjust) which arises out of or in connection with this Contract or any other agreement between the Port Authority and the Contractor is made against the Port Authority or (3) any subcontractor under this Contract or any other agreement between the Port Authority and the Contractor fails to pay any claims lawfully made against it by any supplier, subcontractor, worker or other third person which arises out of or in connection with this Contract or any other agreement between the Port Authority and the Contractor or if in the opinion of the Port Authority any of the aforesaid contingencies is likely to arise, then the Port Authority shall have the right, in its discretion, to withhold out of any payment (final or otherwise) such sums as the Port Authority may deem ample to protect it against delay or loss or to assure the payment of just claims of third persons, and to apply such sums in such manner as the Port Authority may deem proper to secure such protection or satisfy such claims. All sums so applied shall be deducted from the Contractor's compensation. Omission by the Port Authority to withhold out of any payment, final or otherwise, a sum for any of the above contingencies, even though such contingency has occurred at the time of such payment, shall not be deemed to indicate that the Port Authority does not intend to exercise its right with respect to such contingency. Neither the above provisions for rights of the Port Authority to withhold and apply monies nor any exercise or attempted exercise of, or omission to exercise, such rights by the Port Authority shall create any obligation of any kind to such supplier, subcontractors, worker or other third persons. If, however, the payment of any amount due the Contractor shall be improperly delayed, the Port Authority shall pay the Contractor interest thereon at the rate of 6% per annum for the period of the

delay, it being agreed that such interest shall be in lieu of and in liquidation of any damages to the Contractor because of such delay.

- i. If the Port Authority has paid any sum or has incurred any obligation or expense which the Contractor has agreed to pay or reimburse the Port Authority, or if the Port Authority is required or elects to pay any sum or sums or incurs any obligations or expense by reason of the failure, neglect or refusal of the Contractor to perform or fulfill any one or more of the conditions, covenants, or agreements contained in this Contract, or as a result of an act of omission of the Contractor contrary to the said conditions, covenants and agreements, the Contractor shall pay to the Port Authority the sum or sums so paid or expense so incurred, including all interests, costs and damages, promptly upon the receipt of the Port Authority's statement therefore. The Port Authority may, however, in its discretion, elect to deduct said sum or sums from any payment payable by it to the Contractor.
- j. If the Port Authority pays any installment to the Contractor without reducing said installment as provided in this Contract, it may reduce any succeeding installment by the proper amount, or it may bill the Contractor for the amount by which the installment paid should have been reduced and the Contractor shall pay to the Port Authority any such amount promptly upon receipt of the Port Authority's statement therefore.
- k. The Port Authority shall also have the rights set forth above in the event the Contractor shall become insolvent or bankrupt or if his affairs are placed in the hands of a receiver, trustee or assignee for the benefit of creditors.

15. Sales or Compensating Use Taxes

Purchases of services and tangible personal property by the Port Authority in the States of New York and New Jersey are generally exempt from state and local sales and compensating use taxes, and from most federal excises (Taxes). Therefore, the Port Authority's purchase of the Contractor's services under this Contract is exempt from Taxes. Accordingly, the Contractor must not include Taxes in the price charged to the Port Authority for the Contractor's services under this Contract. The Contractor certifies that there are no such taxes included in the prices for this Contract. The Contractor shall retain a copy of this Contract to substantiate the exempt sale.

The compensation set forth in this Agreement is the complete compensation to the Contractor, and the Port Authority will not separately reimburse the Contractor for any taxes unless specifically set forth in this Agreement.

16. No Estoppel or Waiver

The Port Authority shall not be precluded or estopped by any payment, final or otherwise, issued or made under this Contract, from showing at any time the true amount and character of the services performed, or from showing that any such payment is incorrect or was improperly issued or made; and the Port Authority shall not be precluded or estopped, notwithstanding any such payment, from recovering from the Contractor any damages which it may sustain by reason of any failure on its part to comply strictly with this Contract, and any moneys which may be paid to it or for its account in excess of those to which it is lawfully entitled.

No cancellation, rescission or annulment hereof, in whole or as to any part of the services to be provided hereunder, or because of any breach hereof, shall be deemed a waiver of any money damages to which the Port Authority may be entitled because of such breach. Moreover, no waiver by the Authority of any breach of this Contract shall be deemed to be a waiver of any other or any subsequent breach.

17. Records and Reports

The Contractor shall set up, keep and maintain (and shall cause its subcontractors to set up, keep and maintain) in accordance with generally accepted accounting practice during the term of this Agreement and

any extensions thereof and for three years after the expiration, termination or revocation thereof, records, payroll records and books of account (including, but not limited to, records of original entry and daily forms, payroll runs, cancelled checks, time records, union agreements, contracts with health, pension and other third party benefit providers) recording all transactions of the Contractor (and its subcontractors), at, through or in any way connected with or related to the operations of the Contractor (and its subcontractors) hereunder, including but not limited to all matters relating to the charges payable to the Contractor hereunder, all wages and supplemental benefits paid or provided to or for its employees (and its subcontractors' employees) and such additional information as the Port Authority may from time to time and at any time require, and also including, if appropriate, recording the actual number of hours of service provided under the Contract, and keeping separate records thereof which records and books of account shall be kept at all times within the Port District. The Contractor shall permit (and cause its subcontractors to permit) in ordinary business hours during the term of this Agreement including any extensions thereof and for three years thereafter the examination and audit by the officers, employees and representatives of the Port Authority of such records and books of account and also any records and books of account of any company which is owned or controlled by the Contractor, or which owns or controls the Contractor if said company performs services similar to those performed by the Contractor anywhere in the Port District. However, if within the aforesaid three year period the Port Authority has notified the Contractor in writing of a pending claim by the Port Authority under or in connection with this Contract to which any of the aforesaid records and documents of the Contractor or of its subcontractors relate either directly or indirectly, then the period of such right of access shall be extended to the expiration of six years from the date of final payment with respect to the records and documents involved.

Upon request of the Port Authority, the Contractor shall furnish or provide access to the federal Form I-9 (Employment Eligibility Verification) for each individual performing work under this Contract. This includes citizens and noncitizens.

The Contractor (and its subcontractors) shall, at its own expense, install, maintain and use such equipment and devices for recording the labor hours of the service as shall be appropriate to its business and necessary or desirable to keep accurate records of the same and as the general manager or the Facility Manager may from time to time require, and the Contractor (and its subcontractors) shall at all reasonable times allow inspection by the agents and employees of the Port Authority of all such equipment or devices.

- a. The Contractor hereby further agrees to furnish to the Port Authority from time to time such written reports in connection with its operations hereunder as the Port Authority may deem necessary or desirable. The format of all forms, schedules and reports furnished by the Contractor to the Port Authority shall be subject to the continuing approval of the Port Authority.
- b. No provision in this Contract giving the Port Authority a right of access to records and documents is intended to impair or affect any right of access to records and documents which they would have in the absence of such provision. Additional record keeping may be required under other sections of this Contract.

18. General Obligations

- a. Except where expressly required or permitted herein to be oral, all notices, requests, consents and approvals required to be given to or by either party shall be in writing and all such notices, requests, consents and approvals shall be personally delivered to the other party during regular business hours or forwarded to such party by United States certified mail, return receipt requested, addressed to the other party at its address hereinbefore or hereafter provided. Until further notice the Contractor hereby designates the address shown on the bottom of the Contractors Signature Sheet as their address to which such notices, requests, consents, or approvals may be forwarded. All notices, requests, consents, or approvals of the Contractor shall be forwarded to the Manager at the Facility.
- b. The Contractor shall comply with the provisions of all present and future federal, state and municipal laws, rules, regulations, requirements, ordinances, orders and directions which pertain to its operations

under this Contract and which affect the Contract or the performance thereof and those engaged therein as if the said Contract were being performed for a private corporation, except where stricter requirements are contained in the Contract in which case the Contract shall control. The Contractor shall procure for itself all licenses, certificates, permits or other authorization from all governmental authorities, if any, having jurisdiction over the Contractor's operations hereunder which may be necessary for the Contractor's operations. The Contractor's obligation to comply with governmental requirements are not to be construed as a submission by the Port Authority to the application to itself of such requirements.

- c. The Contractor shall pay all taxes, license, certification, permit and examination fees and excises which may be assessed on its property or operations hereunder or income therefrom, and shall make all applications, reports and returns required in connection therewith.
- d. The Contractor shall, in conducting its operations hereunder, take all necessary precautions to protect the general environment and to prevent environmental pollution, contamination, damage to property and personal injury. In the event the Contractor encounters material reasonably believed to be asbestos, polychlorinated biphenyl (PCB) or any other hazardous material, in conducting its operations hereunder, the Contractor shall immediately stop Work in the area affected and report the condition in writing to the Manager. Work in the affected area shall not thereafter be resumed by the Contractor except upon the issuance of a written order to that effect from the Manager.
- e. The Contractor shall promptly observe, comply with and execute the provisions of any and all present and future rules and regulations, requirements, standard orders and directions of the American Insurance Association, the Insurance Services Office, National Fire Protection Association, and any other body or organization exercising similar functions which may pertain or apply to the Contractor's operations hereunder.

The Contractor shall not do or permit to be done any act which:

- 1. will invalidate or be in conflict with any fire insurance policies covering the Facility or any part thereof or upon the contents of any building thereon; or
 - 2. will increase the rate of any fire insurance, extended coverage or rental insurance on the Facility or any part thereof or upon the contents of any building thereon; or
 - 3. in the opinion of the Port Authority will constitute a hazardous condition, so as to increase the risk normally attendant upon the operations contemplated by this Contract; or
 - 4. may cause or produce in the premises, or upon the Facility any unusual, noxious or objectionable smoke, gases, vapors, odors; or
 - 5. may interfere with the effectiveness or accessibility of the drainage and sewerage system, fire protection system, sprinkler system, alarm system, fire hydrants and hoses, if any, installed or located or to be installed or located in or on the Facility; or
 - 6. shall constitute a nuisance in or on the Facility or which may result in the creation, commission or maintenance of a nuisance in or on the Facility.
- f. If by reason of the Contractor's failure to comply with the provisions of this Section and provided the Port Authority has given the Contractor five (5) days written notice of its failure and the Contractor shall not have cured said failure within said five (5) days, any fire insurance, extended coverage or rental insurance rate on the Facility or any part thereof or upon the contents of any building thereon shall at any time be higher than it otherwise would be, then the Contractor shall on demand pay the Port Authority that part of all fire insurance, extended coverage or rental insurance premiums paid or payable by the Port Authority which shall have been charged because of such violations by the Contractor.
 - g. The Contractor shall conduct its operations hereunder so as not to endanger, unreasonably interfere with, or delay the operations or activities of any tenants or occupants on the premises or the Facility and, moreover, shall use the same degree of care in performance on the premises as would be required by law of the Port Authority and shall conduct operations hereunder in a courteous, efficient and safe manner.
 - h. The Contractor shall provide such equipment and medical facilities as may be necessary to supply first

aid service in case of accidents to its personnel who may be injured in the furnishing of service hereunder. The Contractor shall maintain standing arrangements for the removal and hospital treatment of any of its personnel who may be injured.

19. Assignments and Subcontracting

- a. The Contractor shall not sell, transfer, mortgage, pledge, subcontract or assign this Contract or any part thereof or any of the rights granted hereunder or any moneys due or to become due to it hereunder or enter into any contract requiring or permitting the doing of anything hereunder by an independent Contractor, without the prior written approval of the Port Authority, and any such sale, transfer, mortgage, pledge, subcontract, assignment or contract without such prior written approval shall be void as to the Port Authority.
- b. All subcontractors who provide permanent personnel to the Contractor for work under this Contract shall be given written notice to comply with all requirements of the Contract. The Contractor shall be responsible and liable for the performance and acts of each subcontractor.
- c. All persons to whom the Contractor sublets services shall be deemed to be its agents and no subletting or approval thereof shall be deemed to release this Contractor from its obligations under this Contract or to impose any obligations on the Port Authority to such subcontractor or to give the subcontractor any rights against the Port Authority.

20. Indemnification and Risks Assumed By The Contractor

To the extent permitted by law, the Contractor shall indemnify and hold harmless the Port Authority, its Commissioners, officers, representatives and employees from and against all claims and demands, just or unjust, of third persons (including Contractor's employees, employees, officers, and agents of the Port Authority) arising out of or in any way connected or alleged to arise out of or alleged to be in any way connected with the Contract and all other services and activities of the Contractor under this Contract and for all expenses incurred by it and by them in the defense, settlement or satisfaction thereof, including without limitation thereto, claims and demands for death, for personal injury or for property damage, direct or consequential, whether they arise from the acts or omissions of the Contractor, the Port Authority, third persons (including Contractor's employees, employees, officers, and agents of the Port Authority), or from the acts of God or the public enemy, or otherwise, including claims and demands of any local jurisdiction against the Port Authority in connection with this Contract.

The Contractor assumes the following risks, whether such risks arise from acts or omissions (negligent or not) of the Contractor, the Port Authority or third persons (including Contractor's employees, employees, officers, and agents of the Port Authority) or from any other cause, excepting only risks occasioned solely by affirmative willful acts of the Port Authority done subsequent to the opening of proposals on this Contract, and shall to the extent permitted by law indemnify the Port Authority for all loss or damage incurred in connection with such risks:

- a. The risk of any and all loss or damage to Port Authority property, equipment (including but not limited to automotive and/or mobile equipment), materials and possessions, on or off the premises, the loss or damage of which shall arise out of the Contractor's operations hereunder. The Contractor shall if so directed by the Port Authority, repair, replace or rebuild to the satisfaction of the Port Authority, any and all parts of the premises or the Facility which may be damaged or destroyed by the acts or omissions of the Contractor, its officers, agents, or employees and if the Contractor shall fail so to repair, replace, or rebuild with due diligence the Port Authority may, at its option, perform any of the foregoing work and the Contractor shall pay to the Port Authority the cost thereof.
- b. The risk of any and all loss or damage of the Contractor's property, equipment (including but not limited to automotive and/or mobile equipment) materials and possessions on the Facility.
- c. The risk of claim, whether made against the Contractor or the Port Authority, for any and all loss or damages occurring to any property, equipment (including but not limited to automotive and/or mobile

equipment), materials and possessions of the Contractor's agents, employees, materialmen and others performing work hereunder.

- d. The risk of claims for injuries, damage or loss of any kind just or unjust of third persons arising or alleged to arise out of the performance of work hereunder, whether such claims are made against the Contractor or the Port Authority.

If so directed, the Contractor shall at its own expense defend any suit based upon any such claim or demand, even if such suit, claim or demand is groundless, false or fraudulent, and in handling such shall not, without obtaining express advance permission from the General Counsel of the Port Authority, raise any defense involving in any way the jurisdiction of the tribunal over the person of the Port Authority, the immunity of the Port Authority, its Commissioners, officers, agents or employees, the governmental nature of the Port Authority or the provision of any statutes respecting suits against the Port Authority.

Neither the requirements of the Port Authority under this Contract, nor of the Port Authority of the methods of performance hereunder nor the failure of the Port Authority to call attention to improper or inadequate methods or to require a change in the method of performance hereunder nor the failure of the Port Authority to direct the Contractor to take any particular precaution or other action or to refrain from doing any particular thing shall relieve the Contractor of its liability for injuries to persons or damage to property or environmental impairment arising out of its operations.

21. Approval of Methods

Neither the approval of the Port Authority of the methods of furnishing services hereunder nor the failure of the Port Authority to call attention to improper or inadequate methods or to require a change in the method of furnishing services hereunder, nor the failure of the Port Authority to direct the Contractor to take any particular precautions or to refrain from doing any particular thing shall relieve the Contractor of its liability for injuries to persons or damage to property or environmental impairment arising out of its operations.

22. Safety and Cleanliness

- a. The Contractor shall, in the furnishing of services hereunder, exercise every precaution to prevent injury to person or damage to property or environmental impairment and avoid inconvenience to the occupants of or any visitors to the Facility. The Contractor shall, without limiting the generality hereof, place such personnel, erect such barricades and railings, give such warnings, display such lights, signals or signs, place such cones and exercise precautions as may be necessary, proper or desirable.
- b. The Contractor shall in case of unsafe floor conditions due to construction, wetness, spillage, sickness and all other types of hazardous conditions proceed to rope off the unsafe area and place appropriate warnings signs to prevent accidents from occurring. The Contractor shall clean said area to the satisfaction of the Manager.
- c. The Contractor shall at all times maintain in a clean and orderly condition and appearance any and all facilities provided by the Port Authority for the Contractor's operations, and all fixtures, sink closets, equipment, and other personal property of the Port Authority which are located in said facilities.

23. Accident Reports

The Contractor shall promptly report in writing to the Manager of the Facility and to the Deputy Chief, Litigation Management of the Port Authority all accidents whatsoever arising out of or in connection with its operations hereunder and which result in death or injury to persons or damage to property, setting forth such details thereof as the Port Authority may desire. In addition, if death or serious injury or serious damage is caused, such accidents shall be immediately reported by telephone to the aforesaid representatives of the Port Authority.

24. Trash Removal

The Contractor shall remove daily from the Facility by means provided by the Contractor all garbage, debris and other waste material (solid or liquid) arising out of or in connection with its operations hereunder, and any such garbage, debris and other waste material not immediately removed shall be temporarily stored in a clear and sanitary condition, approved by the Facility Manager and shall be kept covered except when filling or emptying them. The Contractor shall exercise care in removing such garbage, debris and other waste materials from the Facility. The manner of such storage and removal shall always be subject in all respects to the continual approval of the Port Authority. No equipment or facilities of the Port Authority shall be used in such removal unless with its prior consent in writing. No such garbage, debris or other waste materials shall be or be permitted to be thrown, discharged or disposed into or upon the waters at or bounding the Facility.

25. Lost and Found Property

The Contractor shall instruct its personnel that all items of personal property found by the Contractor's employees at the Site must be turned in to the Port Authority and a receipt will be issued therefor.

26. Property of the Contractor

- a. All property of the Contractor at the Site by virtue of this Contract shall be removed on or before the expiration or sooner termination or revocation of this Contract.
- b. If the Contractor shall fail to remove its property upon the expiration, termination or revocation of this Contract the Port Authority may, at its option, dispose of such property as waste or as agent for the Contractor and at the risk and expense of the Contractor, remove such property to a public warehouse, or may retain the same in its own possession, and in either event after the expiration of thirty (30) days may sell the same in accordance with any method deemed appropriate; the proceeds of any such sale shall be applied first, to the expenses of sale and second, to any sums owed by the Contractor to the Port Authority; any balance remaining shall be paid to the Contractor. Any excess of the total cost of removal, storage and sale and other costs incurred by the Port Authority as a result of such failure of performance by the Contractor over the proceeds of sale shall be paid by the Contractor to the Port Authority upon demand.

27. Modification of Contract

This Contract may not be changed except in writing signed by the Port Authority and the Contractor. The Contractor agrees that no representation or warranties shall be binding upon the Port Authority unless expressed in writing in this Contract.

28. Invalid Clauses

If any provision of this Contract shall be such as to destroy its mutuality or to render it invalid or illegal, then, if it shall not appear to have been so material that without it the Contract would not have been made by the parties, it shall not be deemed to form part thereof but the balance of the Contract shall remain in full force and effect.

29. Approval of Materials, Supplies and Equipment

Only Port Authority approved materials, supplies, and equipment are to be used by the Contractor in performing the Work hereunder. Inclusion of chemical containing materials or supplies on the Port Authority Approved Products List – Environmental Protection Supplies constitutes approval. The list may be revised from time to time and at any time by the Port Authority and it shall be incumbent upon the Contractor to obtain the most current list from the Manager of the Facility.

At anytime during the Solicitation, pre-performance or performance periods, the Contractor may propose the use of an alternate product or products to those on the Approved Products List – Environmental Protection Supplies, which product(s) shall be subject to review and approval by the Port Authority. Any alternate

product so approved by the Port Authority may be used by the Contractor in performing the Services hereunder. Until such approval is given, only products on the Approved Products List – Environmental Protection Supplies may be used.

30. Intellectual Property

The right to use all patented materials, appliances, processes of manufacture or types of construction, trade and service marks, copyrights and trade secrets, collectively hereinafter referred to as “Intellectual Property Rights”, in the performance of the work, shall be obtained by the Contractor without separate or additional compensation. Where the services under this Agreement require the Contractor to provide materials, equipment or software for the use of the Port Authority or its employees or agents, the Port Authority shall be provided with the Intellectual Property Rights required for such use without further compensation than is provided for under this Agreement.

The Contractor shall indemnify the Port Authority against and save it harmless from all loss and expense incurred as a result of any claims in the nature of Intellectual Property Rights infringement arising out of the Contractor’s or Port Authority’s use, in accordance with the above immediately preceding paragraph, of any Intellectual Property. The Contractor, if requested, shall conduct all negotiations with respect to and defend such claims. If the Contractor or the Port Authority, its employees or agents be enjoined either temporarily or permanently from the use of any subject matter as to which the Contractor is to indemnify the Port Authority against infringement, then the Port Authority may, without limiting any other rights it may have, require the Contractor to supply temporary or permanent replacement facilities approved by the Manager, and if the Contractor fails to do so the Contractor shall, at its expense, remove all such enjoined facilities and refund the cost thereof to the Port Authority or take such steps as may be necessary to insure compliance by the Contractor and the Port Authority with said injunction, to the satisfaction of the Port Authority.

In addition, the Contractor shall promptly and fully inform the Director in writing of any intellectual property rights disputes, whether existing or potential, of which it has knowledge, relating to any idea, design, method, material, equipment or any other matter related to the subject matter of this Agreement or coming to its attention in connection with this Agreement.

31. Contract Records and Documents – Passwords and Codes

When the performance of the contract services requires the Contractor to produce, compile or maintain records, data, drawings, or documents of any kind, regardless of the media utilized, then all such records, drawings, data and documents which are produced, prepared or compiled in connection with this contract, shall become the property of the Port Authority, and the Port Authority shall have the right to use or permit the use of them and any ideas or methods represented by them for any purpose and at any time without other compensation than that specifically provided herein.

When in the performance of the contract services the Contractor utilizes passwords or codes for any purpose, at any time during or after the performance of such services, upon written request by the Authority, the Contractor shall make available to the designated Authority representative all such passwords and codes.

32. Designated Secure Areas

Services under the Contract may be required in designated secure areas, as the same may be designated by the Manager from time to time (“Secure Areas”). The Port Authority shall require the observance of certain security procedures with respect to Secure Areas, which may include the escort to, at, and/or from said high security areas by security personnel designated by the Contractor or any subcontractor’s personnel required to

work therein. All personnel that require access to designated secure areas who are not under positive escort by an authorized individual will be required to undergo background screening and personal identity verification.

Forty-eight (48) hours prior to the proposed performance of any work in a Secure Area, the Contractor shall notify the Manager. The Contractor shall conform to the procedures as may be established by the Manager from time to time and at any time for access to Secure Areas and the escorting of personnel hereunder. Prior to the start of work, the Contractor shall request a description from the Manager of the Secure Areas which will be in effect on the commencement date. The description of Secure Areas may be changed from time to time and at any time by the Manager during the term of the Contract.

33. Notification of Security Requirements

The Authority has the responsibility of ensuring safe, reliable and secure transportation facilities, systems, and projects to maintain the well-being and economic competitiveness of the region. Therefore, the Authority reserves the right to deny access to certain documents, sensitive security construction sites and facilities (including rental spaces) to any person that declines to abide by Port Authority security procedures and protocols, any person with a criminal record with respect to certain crimes or who may otherwise poses a threat to the construction site or facility security. The Authority reserves the right to impose multiple layers of security requirements on the Contractor, its staff and subcontractors and their staffs depending upon the level of security required, or may make any amendments with respect to such requirements as determined by the Authority.

These security requirements may include but are not limited to the following:

- Execution of Port Authority Approved Non-disclosure Agreements

At the direction of the Port Authority, the Contractor shall be required to have its principals, staff and/or subcontractor(s) and their staff, execute Port Authority approved non-disclosure agreements.

- Contractor/ Subcontractor identity checks and background screening

The Port Authority's designated background screening provider may require inspection of not less than two forms of valid/current government issued identification (at least one having an official photograph) to verify staff's name and residence; screening federal, state, and/or local criminal justice agency information databases and files; screening of any terrorist identification files; access identification to include some form of biometric security methodology such as fingerprint, facial or iris scanning, or the like.

The Contractor may be required to have its staff, and any subcontractor's staff, material-men, visitors or others over whom the Contractor/subcontractor has control, authorize the Authority or its designee to perform background checks, and a personal identity verification check. Such authorization shall be in a form acceptable to the Authority. The Contractor and subcontractors may also be required to use an organization designated by the Authority to perform the background checks.

As of January 29, 2007, the Secure Worker Access Consortium (S.W.A.C.) is the only Port Authority approved provider to be used to conduct background screening and personal identity verification, except as otherwise required by federal law and/or regulation (such as the Transportation Worker Identification Credential for personnel performing in secure areas at Maritime facilities). Information about S.W.A.C., instructions, corporate enrollment, online applications, and location of processing centers can be found at <http://www.secureworker.com>, or S.W.A.C. may be contacted directly at (877) 522-7922 for more information and the latest pricing. The cost for said background checks for staff that pass and are granted a credential shall be reimbursable to the Contractor (and its subcontractors) as an out-of-pocket expense as provided herein. Staff that are rejected for a credential for any reason are not reimbursable.

- Issuance of Photo Identification Credential

No person will be permitted on or about the Authority construction site or facility (including rental spaces) without a facility-specific photo identification credential approved by the Authority. If the authority requires facility-specific identification credential for the Contractor's and the subcontractor's

staff, the Authority will supply such identification at no cost to the Contractor or its subcontractors. Such facility-specific identification credential shall remain the property of the Authority and shall be returned to the Authority at the completion or upon request prior to completion of the individual's assignment at the specific facility. It is the responsibility of the appropriate Contractor or subcontractor to immediately report to the Authority the loss of any staff member's individual facility-specific identification credential. The Contractor or subcontractor shall be billed for the cost of the replacement identification credential. Contractor's and subcontractor's staff shall display Identification badges in a conspicuous and clearly visible manner, when entering, working or leaving an Authority construction site or facility.

Employees may be required to produce not less than two forms of valid/current government issued identification having an official photograph and an original, unlaminated social security card for identify and SSN verification. Where applicable, for sensitive security construction sites or facilities, successful completion of the application, screening and identify verification for all employees of the Contractor and subcontractors shall be completed prior to being provided a S.W.A.C. ID Photo Identification credential.

- Access control, inspection, and monitoring by security guards

The Authority may provide for Authority construction site or facility (including rental spaces) access control, inspection and monitoring by Port Authority Police or Authority retained contractor security guards. However, this provision shall not relieve the Contractor of its responsibility to secure its equipment and work and that of its subconsultant/subcontractor's and service suppliers at the Authority construction site or facility (including rental spaces). In addition, the Contractor, subcontractor or service provider is not permitted to take photographs, digital images, electronic copying and/or electronic transmission or video recordings or make sketches on any other medium at the Authority construction sites or facilities (including rental spaces), except when necessary to perform the Work under this Contract, without prior written permission from the Authority. Upon request, any photograph, digital images, video recording or sketches made of the Authority construction site or facility shall be submitted to the Authority to determine compliance with this paragraph, which submission shall be conclusive and binding on the submitting entity.

- Compliance with the Port Authority Information Security Handbook

The Contract may require access to Port Authority information considered Protected Information ("PI") as defined in the Port Authority Information Security Handbook ("Handbook"), dated October, 2008, corrected as of November 14, 2013, and as may be further amended. The Handbook and its requirements are hereby incorporated into this agreement and will govern the possession, distribution and use of PI if at any point during the lifecycle of the project or solicitation it becomes necessary for the Contractor to have access to PI. Protecting sensitive information requires the application of uniform safeguarding measures to prevent unauthorized disclosure and to control any authorized disclosure of this information within the Port Authority or when released by the Port Authority to outside entities. The following is an outline of some of the procedures, obligations and directives contained in the Handbook:

- (1) require that the Contractor and subcontractors, when appropriate, sign Non-Disclosure Agreements (NDAs), or an Acknowledgment of an existing NDA, provided by the Authority as a condition of being granted access to Protected Information categorized and protected as per the Handbook;
- (2) require that individuals needing access to PI be required to undergo a background check, pursuant to the process and requirements noted in § 3.2 of the Information Security Handbook.
- (3) require Contractors and commercial enterprises to attend training to ensure security awareness regarding Port Authority information;
- (4) specific guidelines and requirements for the handling of PI to ensure that the storage and protection of PI;
- (5) restrictions on the transfer, shipping, and mailing of PI;
- (6) prohibitions on the publication, posting, modifying, copying, reproducing, republishing, uploading, transmitting, or distributing PI on websites or web pages. This may also include

- restricting persons, who either have not passed a pre-screening background check, or who have not been granted access to PI, from viewing such information;
- (7) require that PI be destroyed using certain methods, measures or technology pursuant to the requirements set forth in the Handbook;
 - (8) require the Contractor to mandate that each of its subcontractors maintain the same levels of security required of the Contractor under any Port Authority awarded contract.
 - (9) prohibit the publication, exchange or dissemination of PI developed from the project or contained in reports, except between Contractors and subcontractors, without prior approval of the Port Authority;
 - (10) require that PI only be reproduced or copied pursuant to the requirements set forth in the Handbook.

- Audits for Compliance with Security Requirements

The Port Authority may conduct random or scheduled examinations of business practices under this section entitled "NOTIFICATION OF SECURITY REQUIREMENTS" and the Handbook in order to assess the extent of compliance with security requirements, Protected Information procedures, protocols and practices, which may include, but not be limited to, verification of background check status, confirmation of completion of specified training, and/or a site visit to view material storage locations and protocols.

34. Construction In Progress

The Contractor recognizes that construction may be in progress at the Facility and may continue throughout the term of this Contract. Notwithstanding, the Contractor shall at all times during the term hereof maintain the same standards of performance and cleanliness as prevails in non-affected areas as required by the standards hereunder.

35. Permit-Required Confined Space Work

Prior to commencement of any work, the Contractor shall request and obtain from the Port Authority a description of all spaces at the facility which are permit-required confined spaces requiring issuance of an OSHA permit.

Prior to the commencement of any work in a permit-required confined space at a Port Authority facility requiring issuance of an OSHA permit, the Contractor shall contact the Manager to obtain an Authority Contractor Permit-Required Confined Space Notification form. The notification form must be filled out and submitted prior to commencing permit-required confined space work. All confined space work shall be performed in accordance with all applicable OSHA requirements. The Contractor shall provide its employees with a copy of its own company permit and shall furnish the Port Authority with a copy of the permit upon completion of the work. The Contractor must supply all equipment required for working in a confined space.

36. Signs

Except with the prior written approval of the Port Authority, the Contractor shall not erect, maintain or display any signs or posters or any advertising on or about the Facility.

37. Vending Machines, Food Preparation

The Contractor shall not install, maintain or operate on the Facility, or on any other Port Authority property, any vending machines without the prior written approval of the Port Authority. No foods or beverages shall be prepared or consumed at the Facility by any of the Contractor's employees except in areas as may be specifically designated by the Port Authority for such purpose.

38. Confidential Information/Non-Publication

a. As used herein, confidential information shall mean all information disclosed to the Contractor or the personnel provided by the Contractor hereunder which relates to the Authority's and/or PATH's past, present, and future research, development and business activities including, but not limited to, software and documentation licensed to the Authority or proprietary to the Authority and/or PATH and all associated software, source code procedures and documentation. Confidential information shall also mean any other tangible or intangible information or materials including but not limited to computer identification numbers, access codes, passwords, and reports obtained and/or used during the performance of the Contractor's Services under this Contract.

b. Confidential information shall also mean and include collectively, as per *The Port Authority of New York & New Jersey Information Security Handbook (October 15, 2008, corrected as of November 14, 2013)*, Protected Information, Confidential Proprietary Information, Confidential Privileged Information and information that is labeled, marked or otherwise identified by or on behalf of the Authority so as to reasonably connote that such information is confidential, privileged, sensitive or proprietary in nature. Confidential Information shall also include all work product that contains or is derived from any of the foregoing, whether in whole or in part, regardless of whether prepared by the Authority or a third-party or when the Authority receives such information from others and agrees to treat such information as Confidential.

c. The Contractor shall hold all such confidential information in trust and confidence for the Authority, and agrees that the Contractor and the personnel provided by the Contractor hereunder shall not, during or after the termination or expiration of this Contract, disclose to any person, firm or corporation, nor use for its own business or benefit, any information obtained by it under or in connection with the supplying of services contemplated by this Contract. The Contractor and the personnel provided by the Contractor hereunder shall not violate in any manner any patent, copyright, trade secret or other proprietary right of the Authority or third persons in connection with their services hereunder, either before or after termination or expiration of this Contract. The Contractor and the personnel provided by the Contractor hereunder shall not willfully or otherwise perform any dishonest or fraudulent acts, breach any security procedures, or damage or destroy any hardware, software or documentation, proprietary or otherwise, in connection with their services hereunder. The Contractor shall promptly and fully inform the Director in writing of any patent, copyright, trade secret or other intellectual property rights or disputes, whether existing or potential, of which the Contractor has knowledge, relating to any idea, design, method, material, equipment or other matter related to this Contract or coming to the Contractor's attention in connection with this Contract.

d. The Contractor shall not issue nor permit to be issued any press release, advertisement, or literature of any kind, which refers to the Port Authority or to the fact that goods have been, are being or will be provided to it and/or that services have been, are being or will be performed for it in connection with this Agreement, unless the vendor first obtains the written approval of the Port Authority. Such approval may be withheld if for any reason the Port Authority believes that the publication of such information would be harmful to the public interest or is in any way undesirable.

39. Time is of the Essence

Time is of the essence in the Contractor's performance of this Contract inasmuch as the Work to be performed will affect the operation of public facilities.

40. Holidays

The following holidays will be observed at the Site:

New Year's Day	Labor Day
Martin Luther King Jr. Day	Columbus Day
Presidents Day	Veterans Day
Memorial Day	Thanksgiving Day
Independence Day	Day After Thanksgiving
Christmas Day	

This list is subject to periodic revision and the Contractor shall be responsible for obtaining all updated lists from the office of the Manager. If any such holiday falls on a Sunday then the next day shall be considered the holiday and/or if any such holiday falls on a Saturday then the preceding day shall be considered the holiday.

41. Personnel Standards

In addition to any specific personnel requirements that may be required under the clause entitled “Personnel Requirements” in the Specifications, the Contractor (and any Subcontractor) shall furnish competent and adequately trained personnel to perform the Work hereunder. If, in the opinion of the Manager, any employee so assigned is performing their functions unsatisfactorily, they shall be replaced by the Contractor within twenty-four (24) hours following the Contractor’s receipt of the Manager’s request for such replacement.

All Contractor's employees performing Work hereunder shall have the ability to communicate in the English language to the extent necessary to comprehend directions given by either the Contractor's supervisory staff or by the Manager's staff. Any employee operating a motor vehicle must have a valid driver's license.

The Contractor shall verify that employees working under this Contract in the United States are legally present in the United States and authorized to work by means of the federally required I-9 program

42. General Uniform Requirements for Contractor’s Personnel

In addition to any specific uniform requirements that may be required by the Specifications, uniforms must be worn at all times during which the Services are being performed hereunder. The Contractor agrees that his/her employees will present a neat, clean and orderly appearance at all times. Uniforms shall include the Contractor’s identification badge with picture ID bearing the employee’s name. All uniforms, colors, types and styles shall be subject to the prior approval of the Manager. The Contractor will also be responsible for ensuring that its employees are wearing shoes appropriate for the tasks performed. The Manager shall have the right to require removal of any employee who shall fail to wear the proper uniform and shoes, and the exercise of this right shall not limit the obligation of the Contractor to perform the Services or to furnish any required number of employees at a specific location at the Site as specified.

43. Labor, Equipment and Materials Supplied by the Contractor

The Contractor shall, at all times during the performance of this Contract, furnish all necessary labor, supervision, equipment and materials necessary for the prompt and efficient performance of the Work, whether such materials and equipment are actually employed in the furnishing of the Work or whether incidental thereto.

All materials used by the Contractor in furnishing Work hereunder shall be of such quality as to accomplish the purposes of this Contract and the Services to be furnished hereunder in such manner so as not to damage any part of the Site.

The Port Authority by its officers, employees and representatives shall have the right at all times to examine the supplies, materials and equipment used by the Contractor, to observe the operations of the Contractor, its

agents, servants and employees and to do any act or thing which the Port Authority may be obligated or have the right to do under this Contract or otherwise.

All equipment, materials and supplies used in the performance of this Contract required hereunder shall be used in accordance with their manufacturer's instructions.

Materials and supplies to be provided by the Contractor hereunder shall comply with OSHA and all applicable regulations.

44. Contractor's Vehicles – Parking - Licenses

At the discretion of the Manager, the Port Authority may permit the Contractor during the effective period of this Contract to park vehicle(s) used by it in its operations hereunder in such location as may from time to time or at any time be designated by the Manager. The Contractor shall comply with such existing rules, regulations and procedures as are now in force and such reasonable future rules, regulations and procedures as may hereafter be adopted by the Port Authority for the safety and convenience of persons who park automotive vehicles in any parking area at the Site or for the safety and proper persons who park automotive vehicles in any parking area at the Site or for the safety and proper identification of such vehicles, and the Contractor shall also comply with any and all directions pertaining to such parking which may be given from time to time and at any time by the Manager. Any vehicle used by the Contractor hereunder shall be marked or placarded, identifying it as the Contractor's vehicle.

45. Manager's Authority

In the performance of the Work hereunder, the Contractor shall conform to all orders, directions and requirements of the Manager and shall perform the Work hereunder to the satisfaction of the Manager at such times and places, by such methods and in such manner and sequence as he/she may require, and the Contract shall at all stages be subject to his/her inspection. The Manager shall determine the amount, quality, acceptability and fitness of all parts of the Work and shall interpret the Specifications and any orders for Extra Work. The Contractor shall employ no equipment, materials, methods or staff or personnel to which the Manager objects. Upon request, the Manager shall confirm in writing any oral order, direction, requirement or determination.

The Manager shall have the authority to decide all questions in connection with the Services to be performed hereunder. The exercise by the Manager of the powers and authorities vested in him/her by this section shall be binding and final upon the Port Authority and the Contractor.

46. Price Preference

If this solicitation has not been set aside for the purposes of making an award based on bids solicited from Port Authority certified Minority Business, Women Business or Small Business Enterprises as indicated by the bidder pre-requisites in Part II hereof, for awards of contracts, not exceeding \$1,000,000, for:

(a) Services, a price preference of 5% is available for New York or New Jersey Small Business Enterprises (SBE); or

(b) Services (excluding Janitorial/Cleaning Services), a price preference of 10% is available for New York or New Jersey Minority or Women Business Enterprises (M/WBE),

certified by the Port Authority by the day before the bid opening.

If the Bidder is a Port Authority certified MBE, WBE or SBE, enter the applicable date(s) certification was obtained in the space provided on the Signature Sheet attached hereto.

47. M/WBE Good Faith Participation

If specified as applicable to this Contract, the Contractor shall use every good-faith effort to provide for participation by certified Minority Business Enterprises (MBEs) and certified Women-owned Business Enterprises (WBEs) as herein defined, in all purchasing and subcontracting opportunities associated with this Contract, including purchase of equipment, supplies and labor services.

Good Faith efforts to include participation by MBEs/WBEs shall include the following:

- a. Dividing the services and materials to be procured into small portions, where feasible.
- b. Giving reasonable advance notice of specific contracting, subcontracting and purchasing opportunities to such MBEs/WBEs as may be appropriate.
- c. Soliciting services and materials from a Port Authority certified MBE/WBE or seeking MBEs/WBEs from other sources. To access the Port Authority's Directory of MBE/WBE Certified Firms go to www.panynj.gov/supplierdiversty
- d. Ensuring that provision is made to provide progress payments to MBEs/WBEs on a timely basis.
- e. Observance of reasonable commercial standards of fair dealing in the respective trade or business.

Subsequent to Contract award, all changes to the M/WBE Participation Plan must be submitted via a modified M/WBE Participation Plan to the Manager for review and approval by the Authority's Office of Business Diversity and Civil Rights. For submittal of modifications to the M/WBE Plan, Contractors are directed to use form PA3749C, which may be downloaded at <http://www.panynj.gov/business-opportunities/become-vendor.html>. The Contractor shall not make changes to its approved M/WBE Participation Plan or substitute M/WBE subcontractors or suppliers for those named in their approved plan without the Manager's prior written approval. Unauthorized changes or substitutions, including performing the work designated for a subcontractor with the Contractor's own forces, shall be a violation of this section. Progress toward attainment of M/WBE participation goals set forth herein will be monitored throughout the duration of this Contract.

The Contractor shall also submit to the Manager, along with invoices, the Statement of Subcontractor Payments as the M/WBE Participation Report, which may be downloaded at <http://www.panynj.gov/business-opportunities/become-vendor.html>. The Statement must include the name and business address of each M/WBE subcontractor and supplier actually involved in the Contract, a description of the work performed and/or product or service supplied by each such subcontractor or supplier, the date and amount of each expenditure, and such other information that may assist the Manager in determining the Contractor's compliance with the foregoing provisions.

If, during the performance of this Contract, the Contractor fails to demonstrate good faith efforts in carrying out its M/WBE Participation Plan and the Contractor has not requested and been granted a full or partial waiver of the M/WBE participation goals set forth in this Contract, the Authority will take into consideration the Contractor's failure to carry out its M/WBE Participation Plan in its evaluation for award of future Authority contracts.

PART III CONTRACTOR'S INTEGRITY PROVISIONS

1. Certification of No Investigation (criminal or civil anti-trust), Indictment, Conviction, Debarment, Suspension, Disqualification and Disclosure of Other Information

By bidding on this Contract, each Bidder and each person signing on behalf of any Bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, that the Bidder and each parent and/or affiliate of the Bidder has not

- a. been indicted or convicted in any jurisdiction;
- b. been suspended, debarred, found not responsible or otherwise disqualified from entering into any contract with any governmental agency or been denied a government contract for failure to meet standards related to the integrity of the Bidder;
- c. had a contract terminated by any governmental agency for breach of contract or for any cause

- based in whole or in part on an indictment or conviction;
- d. ever used a name, trade name or abbreviated name, or an Employer Identification Number different from those inserted in the Bid;
 - e. had any business or professional license suspended or revoked or, within the five years prior to bid opening, had any sanction imposed in excess of fifty thousand dollars (\$50,000) as a result of any judicial or administrative proceeding with respect to any license held or with respect to any violation of a federal, state or local environmental law, rule or regulation;
 - f. had any sanction imposed as a result of a judicial or administrative proceeding related to fraud, extortion, bribery, bid rigging, embezzlement, misrepresentation or anti-trust regardless of the dollar amount of the sanctions or the date of their imposition; and
 - g. been, and is not currently, the subject of a criminal investigation by any federal, state or local prosecuting or investigative agency and/or a civil anti-trust investigation by any federal, state or local prosecuting or investigative agency, including an inspector general of a governmental agency or public authority.

2. Non-Collusive Bidding, and Code of Ethics Certification, Certification of No Solicitation Based On Commission, Percentage, Brokerage, Contingent or Other Fees

By bidding on this Contract, each Bidder and each person signing on behalf of any Bidder certifies, and in the case of a joint bid, each party thereto certifies as to its own organization, that

- a. the prices in its bid have been arrived at independently without collusion, consultation, communication or agreement for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor;
- b. the prices quoted in its bid have not been and will not be knowingly disclosed directly or indirectly by the Bidder prior to the official opening of such bid to any other bidder or to any competitor;
- c. no attempt has been made and none will be made by the Bidder to induce any other person, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition;
- d. this organization has not made any offers or agreements or taken any other action with respect to any Authority employee or former employee or immediate family member of either which would constitute a breach of ethical standards under the Code of Ethics dated March 11, 2014, or as may be revised, (a copy of which is available upon request) nor does this organization have any knowledge of any act on the part of an Authority employee or former Authority employee relating either directly or indirectly to this organization which constitutes a breach of the ethical standards set forth in said Code;
- e. no person or selling agency other than a bona fide employee or bona fide established commercial or selling agency maintained by the Bidder for the purpose of securing business, has been employed or retained by the Bidder to solicit or secure this Contract on the understanding that a commission, percentage, brokerage, contingent, or other fee would be paid to such person or selling agency; and
- f. the Bidder has not offered, promised or given, demanded or accepted, any undue advantage, directly or indirectly, to or from a public official or employee, political candidate, party or party official, or any private sector employee (including a person who directs or works for a private sector enterprise in any capacity), in order to obtain, retain, or direct business or to secure any other improper advantage in connection with this Contract.
- g. no person or organization has been retained, employed or designated on behalf of the Bidder to impact any Port Authority determination with respect to (i) the solicitation, evaluation or award of this Contract, or (ii) the preparation of specifications or request for submissions in connection with this Contract.

The foregoing certifications in this Part III, Sections 1 and 2, shall be deemed to have been made by the Bidder as follows:

- * if the Bidder is a corporation, such certification shall be deemed to have been made not only with respect to the Bidder itself, but also with respect to each parent, affiliate, director, and officer of the Bidder, as well as, to the best of the certifier's knowledge and belief, each stockholder of the Bidder with an ownership interest in excess of 10%;
- * if the Bidder is a partnership, such certification shall be deemed to have been made not only with respect to the Bidder itself, but also with respect to each partner.

Moreover, the foregoing certifications, if made by a corporate Bidder, shall be deemed to have been authorized by the Board of Directors of the Bidder, and such authorization shall be deemed to include the signing and submission of the bid and the inclusion therein of such certification as the act and deed of the corporation.

In any case where the Bidder cannot make the foregoing certifications, the Bidder shall so state and shall furnish with the signed bid a signed statement which sets forth in detail the reasons therefor. If the Bidder is uncertain as to whether it can make the foregoing certifications, it shall so indicate in a signed statement furnished with its bid, setting forth in such statement the reasons for its uncertainty. With respect to the foregoing certification in paragraph "2g", if the Bidder cannot make the certification, it shall provide, in writing, with the signed bid: (i) a list of the name(s), address(es), telephone number(s), and place(s) of principal employment of each such individual or organization; and (ii) a statement as to whether such individual or organization has a "financial interest" in this Contract, as described in the Procurement Disclosure Policy of the Authority (a copy of which is available upon request to the Chief Procurement Officer of the Procurement Department of the Authority). Such disclosure is to be updated, as necessary, up to the time of award of this Contract. As a result of such disclosure, the Port Authority shall take appropriate action up to and including a finding of non-responsibility.

Failure to make the required disclosures shall lead to administrative actions up to and including a finding of non-responsiveness or non-responsibility.

Notwithstanding that the Bidder may be able to make the foregoing certifications at the time the bid is submitted, the Bidder shall immediately notify the Authority in writing during the period of irrevocability of bids and the term of the Contract, if Bidder is awarded the Contract, of any change of circumstances which might under this clause make it unable to make the foregoing certifications, might render any portion of the certifications previously made invalid, or require disclosure. The foregoing certifications or signed statement shall be deemed to have been made by the Bidder with full knowledge that they would become a part of the records of the Authority and that the Authority will rely on their truth and accuracy in awarding and continuing this Contract. In the event that the Authority should determine at any time prior or subsequent to the award of this Contract that the Bidder has falsely certified as to any material item in the foregoing certifications, has failed to immediately notify the Port Authority of any change in circumstances which might make it unable to make the foregoing certifications, might render any portion of the certifications previously made invalid, or require disclosure, or has willfully or fraudulently furnished a signed statement which is false in any material respect, or has not fully and accurately represented any circumstance with respect to any item in the foregoing certifications required to be disclosed, the Authority may determine that the Bidder is not a responsible Bidder with respect to its bid on the Contract or with respect to future bids on Authority contracts and may exercise such other remedies as are provided to it by the Contract with respect to these matters. In addition, Bidders are advised that knowingly providing a false certification or statement pursuant hereto may be the basis for prosecution for offering a false instrument for filing (see e.g. New York Penal Law, Section 175.30 et seq.). Bidders are also advised that the inability to make such certification will not in and of itself disqualify a Bidder, and that in each instance the Authority will evaluate the reasons therefor provided by the Bidder. Under certain circumstances the Bidder may be required as a condition of Contract award to enter into a Monitoring Agreement under which it will be required to take certain specified actions, including compensating an independent Monitor to be selected by the Port Authority, said Monitor to be charged with, among other things, auditing the actions of the Bidder to determine whether its business practices and

relationships indicate a level of integrity sufficient to permit it to continue business with the Port Authority.

3. Bidder Eligibility for Award of Contracts - Determination by an Agency of the State of New York or New Jersey Concerning Eligibility to Receive Public Contracts

Bidders are advised that the Authority has adopted a policy to the effect that in awarding its contracts it will honor any determination by an agency of the State of New York or New Jersey that a Bidder is not eligible to bid on or be awarded public contracts because the Bidder has been determined to have engaged in illegal or dishonest conduct or to have violated prevailing rate of wage legislation.

The policy permits a Bidder whose ineligibility has been so determined by an agency of the State of New York or New Jersey to submit a bid on a Port Authority contract and then to establish that it is eligible to be awarded a contract on which it has bid because (i) the state agency determination relied upon does not apply to the Bidder, or (ii) the state agency determination relied upon was made without affording the Bidder the notice and hearing to which the Bidder was entitled by the requirements of due process of law, or (iii) the state agency determination was clearly erroneous or (iv) the state determination relied upon was not based on a finding of conduct demonstrating a lack of integrity or violation of a prevailing rate of wage law.

The full text of the resolution adopting the policy may be found in the Minutes of the Authority's Board of Commissioners meeting of September 9, 1993.

4. Contractor Responsibility, Suspension of Work and Termination

During the term of this Contract, the Contractor shall at all times during the Contract term remain responsible. The Contractor agrees, if requested by the Port Authority to present evidence of its continuing legal authority to do business in the States of New Jersey or New York, integrity, experience, ability, prior performance, and organizational and financial capacity.

The Port Authority, in its sole discretion, reserves the right to suspend any or all activities under this Contract, at any time, when it discovers information that calls into question the responsibility of the Contractor. In the event of such suspension, the Contractor will be given written notice outlining the particulars of such suspension. Upon issuance of such notice, the Contractor must comply with the terms of the suspension order. Contract activity may resume at such time as the Port Authority issues a written notice authorizing a resumption of performance under the Contract.

Upon written notice to the Contractor, and an opportunity to be heard with appropriate Port Authority officials or staff, the Contract may be terminated by Port Authority at the Contractor's expense where the Contractor is determined by the Port Authority to be non-responsible. In such event, the Port Authority or its designee may complete the contractual requirements in any manner he or she may deem advisable and pursue available legal or equitable remedies for breach, including recovery of costs from Contractor associated with such termination.

5. No Gifts, Gratuities, Offers of Employment, Etc.

At all times, the Contractor shall not offer, give or agree to give anything of value either to a Port Authority employee, agent, job shopper, consultant, construction manager or other person or firm representing the Port Authority, or to a member of the immediate family (i.e., a spouse, child, parent, brother or sister) of any of the foregoing, in connection with the performance by such employee, agent, job shopper, consultant, construction manager or other person or firm representing the Port Authority of duties involving transactions with the Contractor on behalf of the Port Authority, whether or not such duties are related to this Contract or any other Port Authority contract or matter. Any such conduct shall be deemed a material breach of this Contract.

As used herein "anything of value" shall include but not be limited to any (a) favors, such as meals, entertainment, transportation (other than that contemplated by the Contract or any other Port Authority contract),

etc. which might tend to obligate the Port Authority employee to the Contractor, and (b) gift, gratuity, money, goods, equipment, services, lodging, discounts not available to the general public, offers or promises of employment, loans or the cancellation thereof, preferential treatment or business opportunity. Such term shall not include compensation contemplated by this Contract or any other Port Authority contract. Where used herein, the term "Port Authority" shall be deemed to include all subsidiaries of the Port Authority.

The Contractor shall insure that no gratuities of any kind or nature whatsoever shall be solicited or accepted by it and by its personnel for any reason whatsoever from the passengers, tenants, customers or other persons using the Facility and shall so instruct its personnel.

In the event that the Contractor becomes aware of the occurrence of any conduct that is prohibited by this section entitled "No Gifts, Gratuities, Offers of Employment, Etc.", it shall report such occurrence to the Port Authority's Office of Inspector General within three (3) business days of obtaining such knowledge. (See "<http://www.panynj.gov/inspector-general>" for information about to report information to the Office of Inspector General). Failing to report such conduct shall be grounds for a finding of non-responsibility.

In addition, during the term of this Contract, the Contractor shall not make an offer of employment or use confidential information in a manner proscribed by the Code of Ethics and Financial Disclosure dated March 11, 2014, or as may be revised (a copy of which is available upon request to the Office of the Secretary of the Port Authority).

The Contractor shall include the provisions of this clause in each subcontract entered into under this Contract.

6. Conflict of Interest

During the term of this Contract, the Contractor shall not participate in any way in the preparation, negotiation or award of any contract (other than a contract for its own services to the Authority) to which it is contemplated the Port Authority may become a party, or participate in any way in the review or resolution of a claim in connection with such a contract if the Contractor has a substantial financial interest in the contractor or potential contractor of the Port Authority or if the Contractor has an arrangement for future employment or for any other business relationship with said contractor or potential contractor, nor shall the Contractor at any time take any other action which might be viewed as or give the appearance of conflict of interest on its part. If the possibility of such an arrangement for future employment or for another business arrangement has been or is the subject of a previous or current discussion, or if the Contractor has reason to believe such an arrangement may be the subject of future discussion, or if the Contractor has any financial interest, substantial or not, in a contractor or potential contractor of the Authority, and the Contractor's participation in the preparation, negotiation or award of any contract with such a contractor or the review or resolution of a claim in connection with such a contract is contemplated or if the Contractor has reason to believe that any other situation exists which might be viewed as or give the appearance of a conflict of interest, the Contractor shall immediately inform the Chief Procurement Officer in writing of such situation giving the full details thereof. Unless the Contractor receives the specific written approval of the Chief Procurement Officer, the Contractor shall not take the contemplated action which might be viewed as or give the appearance of a conflict of interest. The Chief Procurement Officer may require the Contractor to submit a mitigation plan addressing and mitigating any disclosed or undisclosed conflict, which is subject to the approval of the Chief Procurement Officer and shall become a requirement, as though fully set forth in this Contract. In the event the Chief Procurement Officer shall determine that the performance by the Contractor of a portion of its Services under this Agreement is precluded by the provisions of this numbered paragraph, or a portion of the Contractor's said Services is determined by the Chief Procurement Officer to be no longer appropriate because of such preclusion, then the Chief Procurement Officer shall have full authority on behalf of both parties to order that such portion of the Contractor's Services not be performed by the Contractor, reserving the right, however, to have the Services performed by others and any lump sum compensation payable hereunder which is applicable to the deleted work shall be equitably adjusted by the parties. The Contractor's execution of this document shall constitute a representation by the Contractor that at the time of such execution the Contractor knows of no circumstances, present or anticipated, which come within the provisions of this paragraph or which might otherwise be viewed as or give the appearance of a conflict of

interest on the Contractor's part. The Contractor acknowledges that the Authority may preclude it from involvement in certain disposition/privatization initiatives or transactions that result from the findings of its evaluations hereunder or from participation in any contract, which results, directly or indirectly, from the Services provided by the Contractor hereunder. The Port Authority's determination regarding any questions of conflict of interest shall be final.

7. Definitions

As used in this section, the following terms shall mean:

Affiliate - Two or more firms are affiliates if a parent owns more than fifty percent of the voting stock of each of the firms, or a common shareholder or group of shareholders owns more than fifty percent of the voting stock of each of the firms, or if the firms have a common proprietor or general partner.

Agency or Governmental Agency - Any federal, state, city or other local agency, including departments, offices, public authorities and corporations, boards of education and higher education, public development corporations, local development corporations and others.

Investigation - Any inquiries made by any federal, state or local criminal prosecuting and/or law enforcement agency and any inquiries concerning civil anti-trust investigations made by any federal, state or local governmental agency. Except for inquiries concerning civil anti-trust investigations, the term does not include inquiries made by any civil government agency concerning compliance with any regulation, the nature of which does not carry criminal penalties, nor does it include any background investigations for employment, or Federal, State, and local inquiries into tax returns.

Officer - Any individual who serves as chief executive officer, chief financial officer, or chief operating officer of the Bidder by whatever titles known.

Parent - An individual, partnership, joint venture or corporation which owns more than 50% of the voting stock of the Bidder.

If the solicitation is a Request for Proposal:

Bid - shall mean Proposal;
Bidder - shall mean Proposer;
Bidding - shall mean submitting a Proposal.

In a Contract resulting from the taking of bids:

Bid - shall mean bid;
Bidder - shall mean Bidder; except and until the Contract has been awarded, then it shall mean Contractor
Bidding - shall mean executing this Contract.

In a Contract resulting from the taking of Proposals:

Bid - shall mean Proposal;
Bidder - shall mean Proposer;
Bidding - shall mean executing this Contract.