

**THE PORT AUTHORITY OF NEW YORK AND NEW JERSEY
TWO MONTGOMERY STREET - 1st FLOOR
JERSEY CITY, NJ 07302**

July 5, 2018

ADDENDUM NO. 2

TO PROSPECTIVE BIDDERS ON CONTRACT GWB-244.049 – GEORGE WASHINGTON BRIDGE – TRANS-MANHATTAN EXPRESSWAY MEDIAN BARRIERS AND WATER SYSTEM 'C' REHABILITATION

The following changes are hereby made in the Contract Documents for the subject Contract.

This communication should be physically annexed to back cover of the book and initialed by each bidder before submitting his bid.

In case any bidder fails to conform to these instructions, his Bid will nevertheless be construed as though this communication had been so physically annexed and initialed.

CHANGES IN THE CONTRACT BOOKLET

Page v - Under the heading **DIVISION 02 - SITEWORK**, immediately following "02581 WET REFLECTIVE THERMOPLASTIC PAVEMENT MARKINGS" insert new line "02583 PREFORMED RETRO-REFLECTIVE PAVEMENT MARKINGS (HIGH PERFORMANCE WET REFLECTIVE TAPE)".

Page 279 - Immediately following this page, insert new pages 279A through 279G (7 pages) which are attached hereto and made a part hereof.

THE PORT AUTHORITY OF NEW YORK AND NEW JERSEY

James Starace, P.E.
Chief Engineer/Director

INITIALED BY THE BIDDER:

DIVISION 2**SECTION 02583****PREFORMED RETRO-REFLECTIVE PAVEMENT MARKINGS
(HIGH PERFORMANCE WET REFLECTIVE TAPE)****PART 1. GENERAL****1.01 SUMMARY**

This Section specifies requirements for the following:

- A. Preformed retro-reflective pavement markings for lane lines, stop lines, crosswalks, traffic arrows, symbols and legends.
- B. Preparation of pavement surfaces for installation of preformed retro-reflective pavement 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 International (ASTM)

ASTM D 1535	Practice for Specifying Color by the Munsell System
ASTM D 4061	Standard Test Method for Retroreflectance of Horizontal Coatings
ASTM E 303	Test Method for Measuring Surface Frictional Properties using the British Pendulum Tester
ASTM E 1710	Test Method for Measurement of Retroreflective Pavement Marking Materials with CEN – Prescribed Geometry Using a Portable Retroreflectometer
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 for Streets and Highways
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1.03 WARRANTY

- A. Obtain manufacturer's warranty that the white and yellow preformed retro-reflective pavement markings will remain effective for its intended use under normal traffic conditions as follows and meet the minimum retained coefficient of dry retro-reflection value of 100 millicandelas per foot squared per foot-candle (in accordance with ASTM E 1710). The dry retro-reflectivity shall be warranted four years for the application of longitudinal pavement markings and two years for pavement marking symbols and legends. The warranty shall begin from the date of installation.

- B. If the pavement markings fail during the warranty period (fail to adhere to the roadway, or fail due to complete wear-through), the manufacturer shall provide the replacement materials, to be installed by the contractor, that will restore the pavement marking retro-reflectivity values to originally specified levels or greater, at no additional cost to the Authority.

1.04 SUBMITTALS

See Appendix "A" for submittal requirements.

PART 2. PRODUCTS

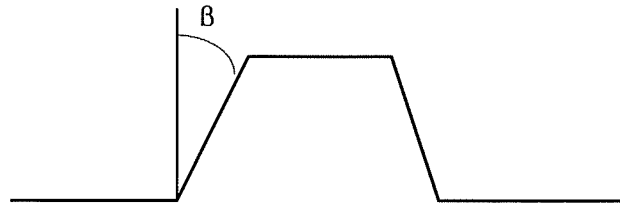
2.01 MANUFACTURERS

Subject to compliance with the requirements of this Section, the preformed retro-reflective pavement markings shall be of one of the following manufactures, or approved equal: "StaMark High Performance Wet Reflective Tape Series" as manufactured by the 3M Company (St. Paul, MN), "Wet Reflective Pavement Tape" as manufactured by InSite Solutions, LLC (Wake Forest, NC), or "Deltaline TWR" as manufactured by Brite-Line (Denver, CO).

2.02 MATERIALS

- A. The preformed retro-reflective pavement markings shall be of two types, Non-Contrasting and Contrasting pavement markings as shown on the Contract Drawings. The standard width of lane line materials shall be as shown on the Contract Drawings:
 - 1. Non-Contrast Pavement Markings shall be placed, as shown on the Contract Drawings, and shall be used for lane lines, edge lines, stop lines, crosswalks, traffic arrows, symbols and legends and shall consist of a patterned retro-reflective white or yellow pliant polymer film.
 - 2. Contrast Pavement Markings shall be placed, as shown on the Contract Drawings, and shall be used on Portland cement concrete pavement for lane lines. The contrast pavement markings shall consist of the retro-reflective white or yellow pliant polymer film with a matte black preformed diamond patterned film border bonded to the marking edges to form a continuous roll. The total width of the contrast pavement marking tape shall be three inches wider than the standard width as shown on the Contract Drawings. 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. Retro-reflective, patterned 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 polyurethane topcoat surface. The patterned surface shall have approximately 50 percent (+/-15 percent) of the surface area raised and presenting a near vertical face (β angle of 0 degrees to 60 degrees) to traffic from any direction. (See Diagram 1 below.) The channels between the raised areas shall be substantially free of exposed beads or particles.

Diagram 1.



- C. The white and yellow portion of the pavement markings shall have the following initial expected retro-reflectance values as measured in accordance with the testing procedures of Table 1. The photometric quantity to be measured shall be coefficient of retro-reflected luminance (RL) and shall be expressed as millicandelas per square foot per foot-candle [(mcd × ft⁻²) × fc⁻¹].
1. Retro-reflectance values shall be measured under dry conditions in accordance with the testing procedures of ASTM E1710.
 2. Retro-reflectance values shall be measured under wet conditions in accordance with ASTM E2832-12 or E2177. Wet retro-reflectance 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. A 0.1 percent by volume liquid soap solution shall be used. Measurements shall be reported as an average for each roll tested, in a minimum of three locations. Wet retro-reflectance values measured under a “condition of wetness” shall be in accordance with ASTM E2177, and the test may be performed with the marking installed on the pavement. New markings shall be tested using a wetting agent, as described above. 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 RETRO-REFLECTANCE

Color	White		Yellow	
	Dry ASTM E1710	Wet & Rainy ASTM E2832-12 or ASTM E2177	Dry ASTM E1710	Wet & Rainy ASTM E2832-12 or ASTM E2177
Entrance Angle	88.76 degrees*	88.76 degrees*	88.76 degrees*	88.76 degrees*
Observation Angle	1.05 degrees	1.05 degrees	1.05 degrees	1.05 degrees
Retro-reflected Luminance, RL	500	250	300	200

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

- D. Preformed retro-reflective pavement markings shall be suitable for application to Portland cement concrete with a pre-coated pressure sensitive adhesive.
- E. Films shall be manufactured without the use of lead chromate pigments or other similar, lead-containing chemicals.
- F. The preformed retro-reflective pavement markings shall be suitable for use for one year after the date of receipt by the Contractor when stored in accordance with the manufacturer's recommendations.
- G. Beads: Index of Refraction: "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. "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.
- H. The preformed retro-reflective pavement markings shall provide a neat and durable pavement marking that will not flow or become distorted due to temperature. The preformed retro-reflective pavement marking 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.
- I. The preformed retro-reflective pavement markings without adhesive shall have a minimum caliper of 0.085 inches at the thickest portion of the patterned cross-section and a minimum caliper of 0.02 inches at the thinnest portion of the cross-section.
- J. Pigments shall be compounded to maintain the original color throughout the expected life of the pavement marking. White pavement marking composition, as placed, shall be white, free from dirt or tint. Yellow pavement marking 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.
- K. Legends, symbols and line pavement markings shall conform to the applicable shapes and sizes specified in FHWA's MUTCD and shall be fabricated from maximum width material to provide the fewest number of contiguous pieces.
- L. Skid Resistance: The patterned surface of the retro-reflective 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 degree angle from that direction. These two values shall then be averaged to find the skid resistance of the patterned surface.
- M. The preformed retro-reflective pavement marking material shall be suitable for use for patching worn areas of the same type in accordance with manufacturer's instructions.
- N. The preformed retro-reflective pavement marking material shall be suitable for installation under the following minimum air and pavement temperatures:
 - 1. Air Temperature: 40 degrees F.
 - 2. Pavement surface Temperature: 40 degrees F.

PART 3. EXECUTION

3.01 INSTALLATION

A. General

1. Apply preformed retro-reflective pavement markings at the locations and in accordance with the patterns and dimensions shown on the Contract Drawings. Dimensional tolerances of pavement markings shall be as specified in 3.01D.
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, and furnish and install traffic control devices to maintain and protect traffic, and to protect marking operations and the newly applied markings until thoroughly set. Lane and Work area closures shall be in accordance with the requirements of the "Maintenance of Traffic and Work Area Protection" of Division 1 - GENERAL PROVISIONS.
4. Apply pavement markings in strict accordance with the manufacturer's installation instructions.

B. Cleaning and Preparation of Pavement Surfaces

1. Confine cleaning and surface preparations to the surface area shown on the Contract Drawings for the application of pavement marking material and to the surface area of existing pavement markings that are shown on the Contract Drawings for removal.
2. Surface preparation Work shall include cleaning for pavement marking lines and cleaning for pavement marking letters and symbols. Pavement marking 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 pavement marking or existing line, plus 1 inch on each side. When pavement marking letters and symbols are installed, the area of preparation shall be sufficiently large to accommodate the marking, or to accommodate removal of the existing marking. Materials used for cleaning pavement of existing marking and any spills, spatter, or overspray shall not damage the paved surface.
3. Whenever a pavement 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 newly placed 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 concrete pavements by either sandblasting or water blasting. When water blasting is performed, apply preformed retro-reflective 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.

C. Application

- 1. Install preformed retro-reflective pavement markings at the locations shown on the Contract Drawings, in accordance with the manufacturer's installation instructions. Marking configurations shall be in accordance with the FHWA's MUTCD.
- 2. Provide application equipment as necessary for the Work requirements. Equipment shall be capable of applying an unlined, pre-coated pressure-sensitive adhesive pavement marking tape. The applicator cart/taper cart shall have a manually actuated tape advance system and a foot-operated cutting mechanism.
- 3. Furnish and install surface preparation adhesive, as required, in accordance with manufacturers' recommendations.
- 4. Apply pavement markings in the general direction of traffic. Applying pavement markings against the direction of traffic flow will not be permitted.
- 5. Establish marking alignment points throughout the length of the marking area as approved by the Engineer.
- 6. 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.
- 7. Prepare or remove and reapply any pavement markings that fail to satisfy the requirements specified in this Section at no additional cost to the Authority.
- 8. Following proper priming, application, and tamping, the markings shall be immediately ready for traffic.

D. Tolerances

- 1. Width of lines: Minus zero, plus 1/8 inch of marking width shown on the Contract Drawings.
- 2. Length of skip 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.

END OF SECTION

SECTION 02583

**PREFORMED RETRO-REFLECTIVE PAVEMENT MARKINGS (HIGH
PERFORMANCE WET REFLECTIVE TAPE)**

APPENDIX "A"

SUBMITTALS

Submit the following in accordance with the requirements of "Shop Drawings, Catalog Cuts and Samples" of Division 1 - GENERAL PROVISIONS:

Product Data

02583D01 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"