

SUPPLEMENTAL SPECIFICATION 620 - TRAFFIC IMPACT ATTENUATORS

620-1 DESCRIPTION

620-1.01 Scope

- a. Traffic Impact Attenuators refer to crash cushions, or inertial crash cushions, also known as modules.
- b. This work shall consist of the furnishing and installation, or removal of Traffic Impact Attenuators in conformity with plans, this specification, and standard drawings.
- c. The work shall also include for all impact attenuators:
 1. The submittal of:
 - a) Installation submittal package
 - b) Inventory data
 - c) Certifications and acceptance documents
 2. Training and support for installation, repair and maintenance.

620-2 MATERIALS

620-2.01 Inertial Crash Cushions

- a. Inertial crash cushions materials shall be as required in the plans, standard drawings, manufacturer's specifications and this specification.
- b. Sand for filler shall be a washed sand conforming to the grading A or B requirements of fine aggregate for concrete given in table 703-1 of specification 707-Aggregates and as per manufacturer's specifications.
- c. Asphalt concrete or concrete pads, when called for in the plans, shall be according to plans, Specification 401-Hot Plant-Mix Bituminous Pavement, Specification 601-Structural Concrete, Specification 602-Reinforcing Steel and manufacturer's specifications.

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620-2.02 Crash Cushions

- a. Crash cushion materials shall be as required in the plans, standard drawings, and according to manufacturer's specifications and this specification.
- b. Concrete for foundation pads and support structure (when required in concrete) shall be according to the manufacturer's specifications, Specification 601-Structural Concrete, and Specification 602-Reinforcing Steel. When called in the plans for asphalt foundation pad, it shall be according to Specification 401-Hot Plant-Mix Bituminous Pavement.
- c. Steel elements and hardware shall comply with ASTM A-36, and ASTM-123. The hot-dip galvanized process shall be after fabrication.

620-3 CONSTRUCTION REQUIREMENTS

620-3.01 Inertial crash cushions

- a. Inertial crash cushion shall comply with the Manual for Assessing Safety Hardware (MASH) and/or National Cooperative Highway Research Program (NCHRP 350) based in the highway classification for the locations, speed and type indicated in plans.
- b. Inertial crash cushion installation including filling with sand, and the securing of the lid shall be completed following manufacturer's specifications and in compliance with all requirements set forth in this specification and approved by the Engineer.
- c. Any required site preparation work indicated in the plans or necessary as per manufacturer's specifications, shall be completed prior installation of the inertial crash cushion.
- d. The final pavement markings for the gore area and any other area affected by the installation activities shall be in conformance with plans, standard drawings, and Specification 618 – Thermoplastic and Preformed Plastic Pavement Markings.
- e. Where an inertial crash cushion array is to be installed at a site with a slope exceeding $\pm 5\%$, the area shall be leveled as shown on the plans and according to manufacturer's specifications.
- f. Follow Maintenance of Traffic according to plans and as accepted by the Engineer.

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- g. Install object marker type 3 in conformance with standard drawings.
- h. The Contractor shall provide to the Engineer an Installation Submittal Package in conformance with the section 620.3.03.
- i. The Contractor shall provide to the Engineer an Inventory Certification according to section 620-3.06.
- j. The Contractor shall submit to the Engineer a Certification for Acceptance according to section 620-3.07.

620.3.02 Crash Cushions

- a. Crash cushions shall comply with the Manual for Assessing Safety Hardware (MASH) and/or National Cooperative Highway Research Program (NCHRP 350) based in the highway classification for locations, type, width and test level indicated in plans; the type is according to standard drawings.
- b. Any required site preparation work shall be completed prior installation of the crash cushion begins.
- c. Crash Cushion installation including the foundation pad shall be accomplished in accordance with the plans, manufacturer's specifications, standard drawings, and this specification.
- d. The final pavement markings for the gore area and any other area affected by the installation shall be in conformance with plans, standard drawings, Specification 618– Thermoplastic and Preformed Plastic Pavement Markings and this specification.
- e. Install delineators according to the plans, standard drawings, and Specification 621-Markers and Delineators.
- f. Install Raised Pavement Markings, according to the plans, standard drawings and Specification 640 – Raised Pavement Markings.
- g. When crash cushion is installed on existing foundation or concrete pavement, the contractor shall drill core samples and test shall be performed according to Specification 601– Structural Concrete as a subsidiary obligation. Test results shall be submitted to the Engineer.
- h. Follow Maintenance of Traffic according to plans and as accepted by the Engineer.

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- i. According to plans, the contractor shall remove existing crash cushions and deliver to the Authority any parts determined by the Engineer to be reusable as a subsidiary obligation.
- j. Galvanized surfaces abraded during handling and installation shall be repaired in conformance with ASTM A780. Use paint containing zinc dust. Reparations include base metal exposure, threaded portion of all fittings and fasteners, and cutting of ends of bolts, as accepted by the Engineer. Follow manufacturer's printed instructions for paint application.
- k. The Contractor shall provide to the Engineer an Installation Submittal Package in conformance with the section 620.3.03.
- l. The Contractor shall provide to the Engineer an Inventory Certification according to section 620-3.06.
- m. The Contractor shall submit to the Engineer a Certification for Acceptance according to section 620-3.07.

620-3.03 Installation Submittal Package

- a. The Contractor shall not begin any activity related to the installation of Traffic Impact Attenuators without Engineer's approval of the Installation Submittal Package.
- b. The Contractor, in conjunction with the manufacturer or its authorized representative, shall submit for the approval of the Engineer, a set of Installation Submittal Package for each location that include the following:
 - 1. Two (2) copies of the product specifications and manuals, both in paper and in electronic media.
 - 2. Installation Plans including:
 - (a) "As built" plans for an area of 100 meters to the front and 50 meters to the back of the proposed Traffic Impact Attenuator location and covering the entire adjacent traveled ways width including the following:
 - (1) Elevation points and contour lines.
 - (2) Details of the road and roadside including but not limited to existing pavement markings, curbs, barriers, drainage, utilities

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and any other road elements that can interfere with the Traffic Impact Attenuator installation.

(3) Transversal and longitudinal slope for proposed Traffic Impact Attenuator location, including crash cushion foundation pad location area.

(4) The “As-built” plan shall be prepared and duly sealed by a Professional Land Surveyor or a Professional Engineer authorized to perform land-surveying work in Puerto Rico.

(b) Site Plans for proposed Traffic Impact Attenuator installation including the following:

(1) Proposed location and front view photo of the location site.

(2) Proposed site improvements works according to plans and manufacturer’s specifications, for the proper installation of the system.

(3) Proposed pavement markings, raised pavement markings, and flexible delineators installation in conformance with plans, standard drawings and this specification.

(4) Structural concrete foundation details including transversal and longitudinal slope, joint details between foundation and the existing pavement.

(5) Anchoring details and torque sequence details, if applicable.

(6) Plan elevation, cross sections, and details of the system components.

(7) Details of the transition to existing or proposed barriers and/or back up structure, if applicable.

(8) Detail of the delineators to be installed including the post, reflective sheeting, base and anchoring method. Include the installation pattern, as applicable for each location and in conformance with the standard drawings.

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(9) The site plans shall be prepared and duly sealed by a Professional Engineer authorized to work in Puerto Rico.

(c) Field Procedures for proposed Traffic Impact Attenuator installation related works including but not limited to the following:

(1) Methods, operations and/or procedures:

i. To keep the system operational during the project construction as applicable.

ii. To the removal of existing traffic attenuator system in an orderly and safety manner.

iii. To avoid untreated end of barriers or roadside obstacles within the clear zone. These procedures could include but are not limited to the use of additional traffic control devices.

c. The Contractor shall submit to the Engineer the Installation Submittal Package at least thirty -five (35) days before the works begin. The Engineer will issue acceptance or rejection of the drawings after the submittal. If the drawings are rejected, the Contractor shall submit revised drawings within the next ten (10) days for approval. Submittals for multiple locations shall be coordinate with the Engineer to avoid longer response times.

d. The Authority reserves the right to reject Installation Submittal Packages that do not comply with the requirements set forth in this specification without further review.

620-3.04 Training and Support

a. The Contractor, in conjunction with the manufacturer or its authorized representative, shall provide training and support for the installation, maintenance and repair of the Traffic Impact Attenuator systems.

b. The training shall be provided for all maintenance crews and any other parties as determined by the Authority. Training must be offered before the date of the installation works begin.

c. The manufacturer shall certify and authorize the instructors to offer the proper training and support. Instructors shall submit credentials regarding to their certification.

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620-3.05 Repair or replacement of Traffic Impact Attenuator during construction

- a. The Contractor shall be responsible for the cost of repair or replacement of any Traffic Impact Attenuator damaged for any reason attributable to negligence or omission in the contractor's work. The Traffic Impact Attenuator system shall be repaired at its installed location within 72 hours considering the availability of the replacement parts and traffic peak hours as directed by the Engineer.

620-3.06 Inventory Data for Traffic Impact Attenuator

- a. The Contractor shall submit an inventory certification for each Traffic Impact Attenuator location.
- b. Each Traffic Impact Attenuator inventory certification shall include the following data:
 1. Contractor's name and contact information
 2. Project information
 3. Manufacturer, model, serial number
 4. Installation date
 5. Final acceptance date
 6. X and Y coordinates (NAD 1983) at the back-top center of the system.
- c. The Contractor is required to submit the inventory data to the Engineer in Excel format via electronic media. The Contractor is responsible to obtain from the Engineer the required electronic format like the figure A attached.

620-3.07 Certification for Acceptance

- a. Acceptance of each Traffic Impact Attenuator system installed on the project shall be based on the fully compliance of the following requirements:
 1. Inspection by the Authority.
 2. Submittal and acceptance of the Installation Submittal Package.
 3. Submittal and acceptance of an inventory data.

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4. Submittal of a material certificate of compliance in conformance with Specification 106. The furnished and installed system shall be free of defects at the time of acceptance, and the hardware must have the same chemistry, mechanical properties, and geometry as that submitted for test and evaluation under MASH and/or NCHRP 350 criteria.

5. Submittal of installation certificate indicating full compliance with the manufacturer's specifications and the warranty period for which the system is covered. The Certificate shall be properly sealed and signed by both, a Professional Engineer licensed in Puerto Rico and the authorized manufacturer's technical representative.

620-4 METHOD OF MEASUREMENT

620-4.01 Each inertial crash cushion for the speed and type specified will be measured as a single unit completed in place and accepted as specified. The unit includes all components necessary to complete the inertial crash cushion array as called for in the plans, specifications and standard drawings or works to be performed including but not limited to object marker sheeting, hardware, sand fill, Installation Submittal Package, inventory certification, training and support, installation certificate and any required site work. Any of the works for the installation that not paid under a separate pay item, shall be considered as a subsidiary obligation of the Contractor.

620-4.02 Crash cushion shall be measured as a single unit, of the type, test level (TL), and width (in) completed in place and accepted as specified. The unit includes all components necessary to complete the crash cushion as called for in the plans, specifications, standard drawings or works to be performed, including but not limited to, the submittal for approval of Installation Submittal Package, training and support, accepted inventory data, installation certificate, construction of foundation pad, transition panels, object marker sheeting, backup structure, and all components necessary to ensure proper performance of the system. Any of the works for the installation not paid under a separate pay item, shall be considered as a subsidiary obligation of the Contractor. The site preparation for the installation of crash cushions, site grading, removal of structures and obstructions, removal and delivery of reusable parts, pavement joints, and any other requirements, which are not paid under a separate pay item, shall be considered as a subsidiary obligation of the Contractor.

620-4.03 The inventory certification (including photos) entered directly into a web based electronic database and the printed copy of the certification for the Engineer's record shall be considered as a subsidiary obligation under the corresponding Traffic Impact Attenuator.

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620-5 BASIS OF PAYMENT

620-5.01 The accepted quantity of inertial crash cushion of each type and speed, measured as provided, will be paid for at the contract price per unit of measurement considering sections 620-5.03 and 620-5.04. Such prices shall constitute full compensation for furnishing and installing all materials, labor, equipment, tools and incidentals necessary to complete the work as required.

620-5.02 The accepted quantity of crash cushions systems, of the type, test level (TL), and width measured as provided above will be paid for at the contract price per unit of measurement considering sections 620-5.03 and 620-5.04. Such prices and payment shall constitute full compensation for furnishing and installing all materials, labor, equipment, tools and incidentals necessary to complete the work as required.

620-5.03 Eighty percent (80%) of the contract unit price for each Traffic Impact Attenuator will be paid after its installation is completed and accepted by the Engineer.

620-5.04 The remaining twenty percent (20%) due to the Contractor will be paid after the Inventory Data information as required by section 620-3.06 is submitted and accepted by the Engineer.

620-5.05 Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Crash Cushion Type____ (I, II, III, IV), TL- ____ (2 or 3), Width__(inches)	Each
Inertial Crash Cushion Type____(V, VI), Speed____	Each