

SPECIAL PROVISION

SPECIFICATION 827 LOAD RATING ANALYSIS AND BRIDGE AS-BUILT DRAWINGS

827-1 DESCRIPTION

827-1.01 Scope

- a. This work shall consist of performing and furnishing Load Rating Analyses and detailed As-Built Drawings for each bridge included in the contract or as directed by the Engineer.
- b. The work shall be performed on bridge projects including but not limited to; new bridge construction, replacement (total or partial), rehabilitation, repair, reconstruction, preservation, strengthening, widening, or any modification to a bridge.
- c. The Contractor shall furnish all labor, materials, computer software, equipment, and incidentals required, to perform and furnish the Load Rating Analyses and the As-Built Drawings, in accordance with the requirements specified herein.
- d. Load Rating Analyses shall meet all the applicable requirements specified in Design Directive 310 – Bridge Load Rating (“Load Rating de Puentes”).
- e. As-Built Drawings shall meet all the applicable requirements specified in Design Directive 112 – Construction Plans Presentation and General Note (“Presentación de los Planos de Construcción y Nota General”).
- f. Each word, sentence, section or article of this document is independent. Not applying parts of it does not imply that it cannot be enforced afterwards, nor invalidates the remaining provisions.

827-1.02 Definitions

- a. Bridge – A structure including supports erected over a depression or an obstruction, such as waterway, highway or railway, and having a track or passageway for carrying traffic or other moving loads, and having an opening measured along the center of the roadway of more than 20 feet between under copings of abutments or spring lines of arches, or extreme ends of openings for single or multiple cell culverts; it may also include multiple pipes, where the clear distance between openings is less than half of the smaller contiguous opening. Structures spanning 15 feet or more but less than 20 feet, measured as described above, will also be considered

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as bridges for the As-Built Drawings requirements covered or referenced in this specification.

- b. Bridge As-Built – Drawing illustrating the components constructed or rehabilitated under any given project once the same has been substantially completed. Bridge As-Built includes, as a minimum but not limited to, the following components: approach slab, parapets, deck/slab, superstructure elements, substructure elements (including wing walls), and scour countermeasures. The As-Built Drawings shall incorporate both the project works and the existing plans, if available, of the remaining components of the structure.

827-1.03 Reference Documents

- a. AASHTO Manual for Bridge Evaluation
- b. AASHTO LRFD Bridge Design Specifications
- c. PRHTA Design Directives
- d. Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges

827-2 LOAD RATING ANALYSIS REQUIREMENTS

827-2.01 General – The determination of the live load carrying capacity of a bridge by means of a Load Rating Analysis is required by the 23 Code of Federal Regulations, Part 650, Subpart C – National Bridge Inspection Standards (NBIS) (23CFR650.C). The Load Rating Analysis shall conform to the following requirements:

- a. The Contractor shall perform the Load Rating Analysis for each bridge using the most recent version of the “AASHTO Manual for Bridge Evaluation” with the load and factor adjustments as provided in the “PRHTA Standard Operating Procedure – Bridge Safety Inspection Manual”.
- b. The Contractor shall perform the Load Rating Analysis after the superstructure is completed (e.g. after beams are placed and slab has been poured).

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- c. The Load Rating Analysis shall be performed using the As-Built Drawings and Shop Drawings submitted by the Contractor as a supplement of the contract documents. The structural model used for the Analysis shall take into consideration any modifications made to the original design.
- d. The Load Rating Analysis shall consider all types of modifications to the structure, including but not limited to, changes in component dimensions (e.g. deck, slab, beams), reinforcement, reinforcement splices and its position, beam casting and stressing sequence, use of temporary or additional prestressed or mild reinforcement, and changes in hunch thickness, among others.
- e. The Load Rating Analysis shall be performed to determine the live load that the bridge can safely carry using the Load and Resistance Factor Rating (LRFR) method reported in Rating Factor (RF) method, rated at two (2) different stress levels:
 - 1. Inventory Rating (calculated RF shall be equal or greater than 1.0)
 - 2. Operating Rating (calculated RF shall be equal or greater than 1.0)
- f. The Contractor shall provide the corresponding posting load if the bridge evaluated requires a load restriction according to the legal Load Ratings.

827-2.02 Computer Software and Tools – Load Rating Analyses shall be performed using the latest release of an applicable program conforming to Design Directive 310 – Bridge Load Rating. In case that the specified programs cannot be used due to geometry, structure type, material, or any other special conditions, the Contractor shall request by written notice the use of other computer software. Such written notice shall include the justification to use other computer software for review and approval by the Bridge Inventory Management Office.

827-2.03 Load Rating Analysis Report – Load Rating Analyses shall include a report comprising all the data and results to be submitted for review and approval by the Engineer. The Load Rating Analysis Report shall conform to the following requirements:

- a. The Contractor shall submit the Load Rating Analysis Report along with the “Report of Bridge Load Rating” template, included as an attachment in the aforementioned Design Directive 310.

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- b. The Load Rating Analysis Report submittal shall consist of one (1) printed copy and in PDF digital format.
- c. The Load Rating Analysis Report shall be prepared, signed and sealed by a Registered Professional Engineer (legally authorized to practice Engineering in Puerto Rico).
- d. The Load Rating Analysis Report shall include the determination of the material properties, any particular details about the current conditions and/or bridge geometry, construction plans used for the Analysis, as well as all calculations related to the Load Rating.
- e. The Load Rating Analysis Report shall list the final inventory and operating ratings of the structure summarized in a tabular form.
- f. The Contractor shall provide an additional set of the Load Rating Analysis Report to be submitted to the Bridge Inventory Management Office. Such set shall include one (1) printed copy, copy in PDF digital format, the program input and output files (digital format), and any data of other programs used in the Analysis, if applicable.

827-3 BRIDGE AS-BUILT DRAWINGS REQUIREMENTS

827-3.01 General – The Contractor shall furnish As-Built Drawings of the bridge after all the works have been completed and accepted.

827-3.02 Computer Software and Tools – As-Built Drawings shall be furnished using the latest release of a computer-aided design (CAD) program submitted for approval by the Engineer to prepare the Drawings.

827-3.03 As-Built Drawings Submittal – As-Built Drawings shall be submitted for review and approval by the Engineer. The As-Built Drawings submittal shall conform to the following requirements:

- a. The As-Built Drawings submittal shall consist of two (2) sets of printed 24-inch by 36-inch copies. Additionally, one (1) CD-ROM, DVD or other media acceptable to the Engineer, including editable (DWG) and non-editable (PDF) digital formats set to be printed in 24 inches by 36 inches paper size shall be submitted.

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- b. The As-Built Drawings shall be prepared, signed and sealed by a Registered Professional Surveyor (legally authorized to practice Surveying in Puerto Rico).

827-4 METHOD OF MEASUREMENT

827-4.01 The Load Rating Analyses and As-Built Drawings for each bridge included in the contract will be measured as follows:

- a. Load Rating Analyses – by the unit for each bridge being analyzed and rated as requested by the contract documents.
- b. As-Built Drawings – by the unit for the set of all drawings furnished and accepted for each project as requested by the contract documents.

The above items include all requirements as established by this specification, including but not limited to: Analysis, computations, reports, computer software, materials, and any required engineering consultants.

827-5 BASIS OF PAYMENT

827-5.01 The completed and accepted works, determined as provided above for the pay items listed below, which are included in the contract, will be paid for at the contract unit price per unit of measurement. Such price and payment shall constitute full compensation for all labor, materials, computer software, equipment, and incidentals necessary to complete each item as required by the specifications specified herein.

827-5.02 Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
Bridge Load Rating, Bridge No. _____ (Identify by type and number of spans) * Each
As-Built Drawings, Bridge No. _____ Each

* The type of bridge or structure shall be in accordance with the National Bridge Inspection Standards (NBIS).