ITEM 06557.96 M - BRIDGE STRUCTURAL ELEMENT LOAD TESTING

Description

This work shall consist of applying loads to existing structural elements as indicated on the plans, and in the drawings attached to this document. The Contractor shall provide a certified design for the load test frame, furnish necessary equipment and personnel for loading the structural element, purchase thermographic diagnostic equipment, control the applied loads as directed by the Engineer and NYSDOT research staff, disassemble and relocate the load frame as necessary, then remove and dispose of tested structural materials and turn over test equipment to the Department.

The work shall include the following tasks:

TASK 1. Provide a design for the load test frame that is certified by a professional engineer registered to practice in New York State.
TASK 2. Purchase infrared thermography equipment for use by the Engineer.
TASK 3. Construct a loading frame.
TASK 4. Control load application jacks during the load testing as directed by the Engineer.
TASK 5. Dismantle the loading frame and reassemble for subsequent tests.
TASK 6. Dispose of the tested structural element(s) materials.
TASK 7. Turn over load cells, jacks and thermography equipment purchased exclusively for this testing to the NYSDOT.

Materials:

Materials for the Loading Frame

Materials for the loading frame shall conform to the requirements of the following subsections:

1. Concrete for cast_in_place footings (or pier foundation) shall be New York State DOT Class “A” concrete conforming to the requirements of Section 501.

2. High Strength Rods anchored in the cast-in-place footing (or pier foundation) for load application shall be DYWIDAG Threadbars, hot rolled and proof-stressed alloy steel or equal conforming to ASTM A-722-75.

3. Bar Reinforcement for Cast-in-Place Footings (or pier foundation) shall be Grade 60 conforming to the requirements of Subsection 709-01.

4. Structural Steel shall meet the requirements of Subsections 564-2 and 715-01.

5. Steel columns, spreader beams, loading beams, and any structural steel sections used in the loading frame assemblies shall be fabricated from ASTM A36 steel.

6. High strength bolts, nuts, and washers used in connection details shall be per ASTM A325.

Loading Jack

Individual loading jacks shall have a minimum capacity of 445 KN (100 kips) and a minimum stroke of 152mm (6 in.) Any number (or combination) of loading jacks may be used to provide the total load specified in this specifications, if approved by the Engineer. The loading jacks and their assemblies (hoses, manifolds, etc.) and the hydraulic system required to apply the load shall also be furnished by the Contractor.

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Instrumentation Gages, Load Cells, and Access

Strain gages for the test will be provided by the NYSDOT. It is the responsibility of the Contractor to provide safe access to the cap beam for mounting of gages by NYSDOT staff. The load cells to measure actual load applied at the specified locations in all three tests shall be furnished by the Contractor. Individual load cells shall have a minimum capacity of 445 KN (100 kips). The system shall be capable of being operated a safe distance away from the bridge element being tested.

Infrared Thermograph Imaging

Infrared (IR) thermograph imaging equipment including camera, software and LCD screen shall be purchased and turned over to the Engineer. The equipment shall meet or exceed the following specifications:

- High resolution thermal image with built-in digital visual camera to capture critical detail and ease of analysis.
- Integral visible light camera
- Imaging performance:

Thermal characteristics:

- Field of View: 24° x 18°
- Spatial Resolution (IFOV): 1.3 mrad
- Thermal sensitivity: 0.08°C at 30°C
- Image Frequency: 50/60 Hz non-interlaced
- Electronic Zoom function: 4X continuous
- Spectral range: 7.5 to 13 µm
- 14 bit radiometric IR digital image (IMG), with all radiometric data.
- 8-bit standard bitmap (BMP), image only or image w/ screen graphics.
  Every image stored in both formats.

Visual:

- Built-in digital video: 640 x 480 pixels, full color
- Video output: RS170 EIA/NTSC or CCIR/PAL composite video
- Viewfinder: Built in high resolution color LCD (TFT)
- Temperature Range -40°C to +120°C (-40° F to +248° F), Range 1
  0°C to +500°C (+32°F to +932°F), Range 2
- Measurement modes: spot (up to 5), area (up to 5), isotherm, line profile, Delta T
- Accuracy: ± 2° C, ± 2%
- Atmospheric transmission correction: Automatic.
- Automatic emissivity correction: Variable from 0.1 to 1.0
- Standard bitmap (BMP); visual images linked with corresponding thermal images(s).
- 30 second of digital voice notation to be stored together with the image.
- Predefined and field editable text selected and stored with image, up to 12 text fields.

Image Storage: Type - High capacity PC-card, 100 Mb or greater (> 600 images)

Power supply:

- 2 each, Internal rechargeable nickel metal hydride (NiMH) battery, field replaceable.
- 2 hours continuous operation.
- 4 bay intelligent battery charger
- AC Power supply

Attachments:

- Shipping & carrying case
- Operating Manual
- Shoulder strap
- Video Cable SMB to BNC/PHONO, 1.6m
- Viewer software
- 5" LCD Color Monitor
- Thermal Camera Reporter Software

Construction Details:

Unless otherwise specified, all tasks and sub-tasks shall be performed by the Contractor or a subContractor. Upon conclusion of the test, all test records and purchased equipment shall be turned over to the Engineer for transfer to the Regional Structures Engineer.

TASK 1. Provide a design for the load test frame that is certified by a professional engineer registered to practice in New York State.

The Contractor shall retain an engineer to design the loading frame, including its anchorage and all its structural elements, based on the maximum expected loads and points of application indicated in the Attachment, or as directed by the Engineer, or as noted in the plans. The Contractor and his engineer shall conduct a visual survey to familiarize themselves with the site. They shall evaluate the type of anchoring system and equipment needed for the job. The Contractor shall notify the Engineer and the Director of the Transportation Research and Development Bureau (TRDB) at least 10 working days in advance of the site survey.

The Contractor shall submit the engineered design of the load test frame and loading mechanism that will safely and uniformly allow the transmission of the loads shown on the attached drawings. The design hall be certified (i.e. signed and sealed) by a professional engineer registered to practice in New York State. The Contractor shall submit three sets of the design calculations, material specifications, and construction details to the Engineer for approval at least one month before the load testing. The Engineer and the Contractor shall allow at least 10 working days for review by the Director of the Transportation Research and Development Bureau.

TASK 2. Purchase infrared thermography equipment for use br the Engineer.

The Contractor shall purchase infrared thermograph equipment meeting the requirements of the materials section of this specification. The Engineer will use the equipment to assess the bond between the composite materials and the concrete structural unit before and during the load test and document the results. Upon completion of the test, the equipment will be retained by the NYSDOT.

TASK 3. Construct a loading frame.

The Contractor shall construct a loading frame and loading mechanism according to the engineered drawings and specifications provided by his engineer and approved by the NYSDOT. It is assumed that a single loading frame will be used for testing all structural elements as specified in the plans, and in the

Attachment. The loading frame shall be designed in such way as to be reusable and moveable for testing the three pier cap beams intended in this contract. Soil information at the site will be provided by NYSDOT upon the Contractor's request.

The schedule for the testing of each structural element shall be determined by the Contractor's schedule, subject to the approval of the Engineer. Any equipment, labor, or materials necessary for the maintenance and protection of traffic shall be provided under the appropriate contract item.

Access is to be provided for the Engineer and other NYSDOT staff to document the condition of the structural element(s). Sketches will be made of the size and location of any concrete spalling or cracking, and a thermographic image will be produced to assess the bond between the concrete and the composite laminates. Any damage to the FRP composite retrofit systems will also be recorded. The Contractor shall provide any necessary assistance such as providing access equipment, power supply, weather protection etc..

TASK 4. Control load application jacks during the load testing as directed by the Engineer.

The Department will supply the loading plan within 5 working days of the approved scheduled testing date for each structural element. Upon determination by the Engineer that the structural element is ready to be tested, the loads designated in the Attachment shall be applied to the structure by the Contractor in stages as directed by the Engineer.

The Contractor shall perform the following during the testing:

- The Contractor shall execute the loading of the structural element according to the supplied loading plan (showing load increments and type of loading such as step or ramp); and shall make provisions for Department staff to safely take specific actions at specified load steps, such as visual inspection, by locking the loading jacks at these loads.
- During the testing, deflections may become excessive and the loading jacks may have to be reset without removing the load from the structure. This shall require locking the load on the structure and resetting the loading jacks' strokes.
- Also, during the testing, if any unanticipated structural behavior is observed, as decided by TRDB and the Engineer, the Contractor will be instructed by the Engineer to apply the load in a manner different from that stated in the original loading plan.

TASK 5. Dismantle the loading frame and reassemble for subsequent tests.

The structural elements shall be tested individually on separate days. The Contractor shall disassemble the loading frame after each test is completed and re-erect it for use in the next test. If any delays are anticipated, the Contractor shall immediately inform the Engineer in writing, with a copy to the Director of TRDB, within the five-working-days period. The structural elements(s) will be tested following the sequence indicated in the plans, or as directed by the Engineer, or as indicated on the attachment to this specification. The Contractor will schedule equipment movements and other activities to ensure that testing is done as part of the normal bridge removal schedule, insofar as it is possible.

TASK 6. Dispose of the tested structural element(s) materials.

The Contractor shall dispose, to the satisfaction of the Engineer, the tested structural element materials, and clear the site of any remaining debris under appropriate items in the contract.

TASK 7. Turn over load cells, jacks and thermography equipment purchased exclusively for this testing.

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The equipment and components, such as the Thermal Image Camera, load cells, jacks, pump systems, or any other incidental equipment purchased solely for the performance of these tests, will become property of the Department; and shall be transported to a location specified by the Engineer.

Method of Measurement:

The unit price bid shall be a lump sum for the series of load tests performed at this site according to the tasks detailed.

Basis of Payment:

The unit price shall include the cost of the design of the loading frame, loading mechanism, all labor, equipment, and materials necessary to construct, erect, maintain, operate, dismantle, transport the frame loading , and equipment as necessary for the completion of the work.

ATTACHMENT TO ITEM 06557.96M

(Drawings Not to Scale)

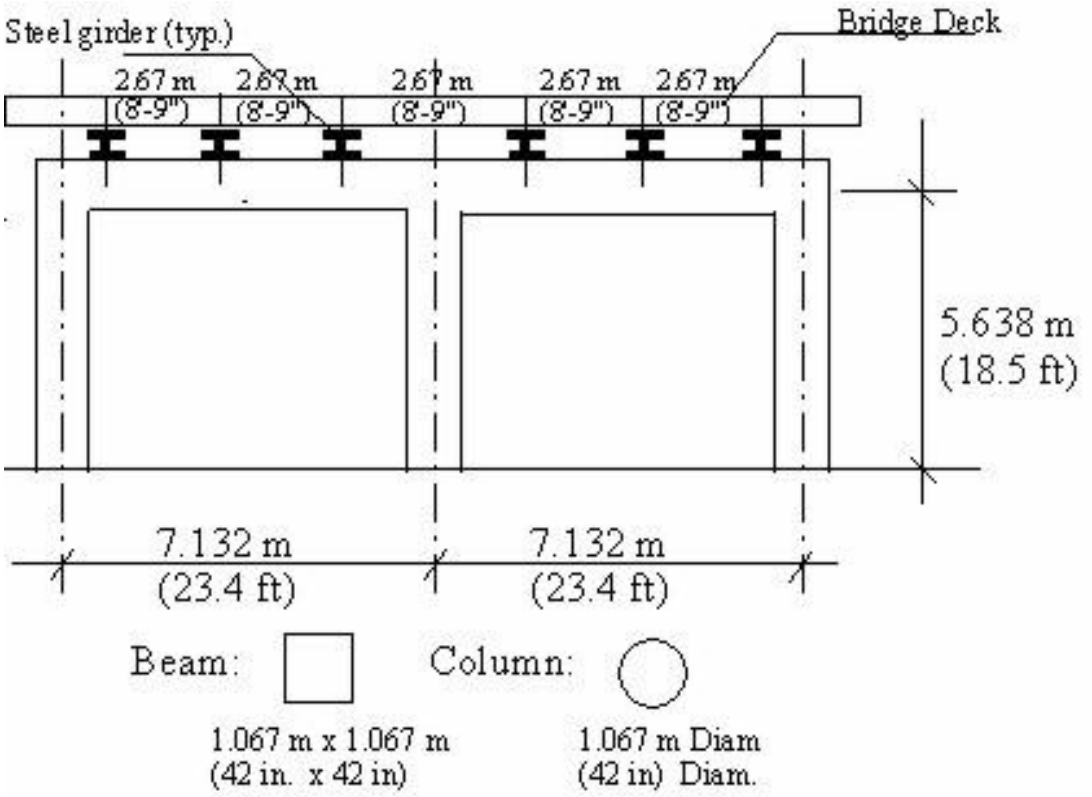

Figure 1. Capbeam at Pier 1.

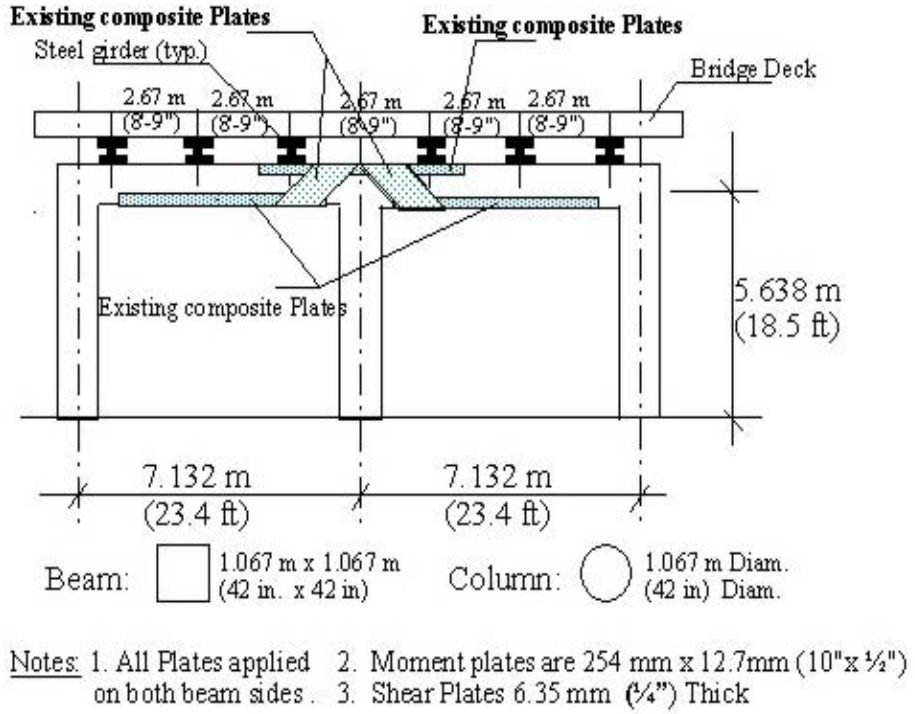

Figure 2. Capbeam at Piers 2 and 3 (Capbeam Pier 2 has similar dimensions with a different strengthening composite scheme).

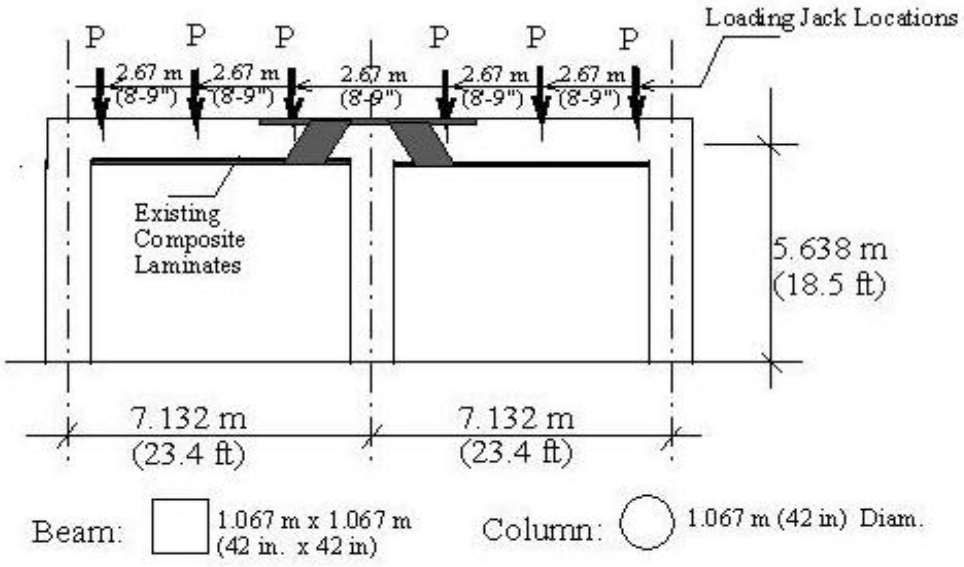

Figure 3. Capbeam at Pier 1 load application locations P=2670 KN (600 kips).

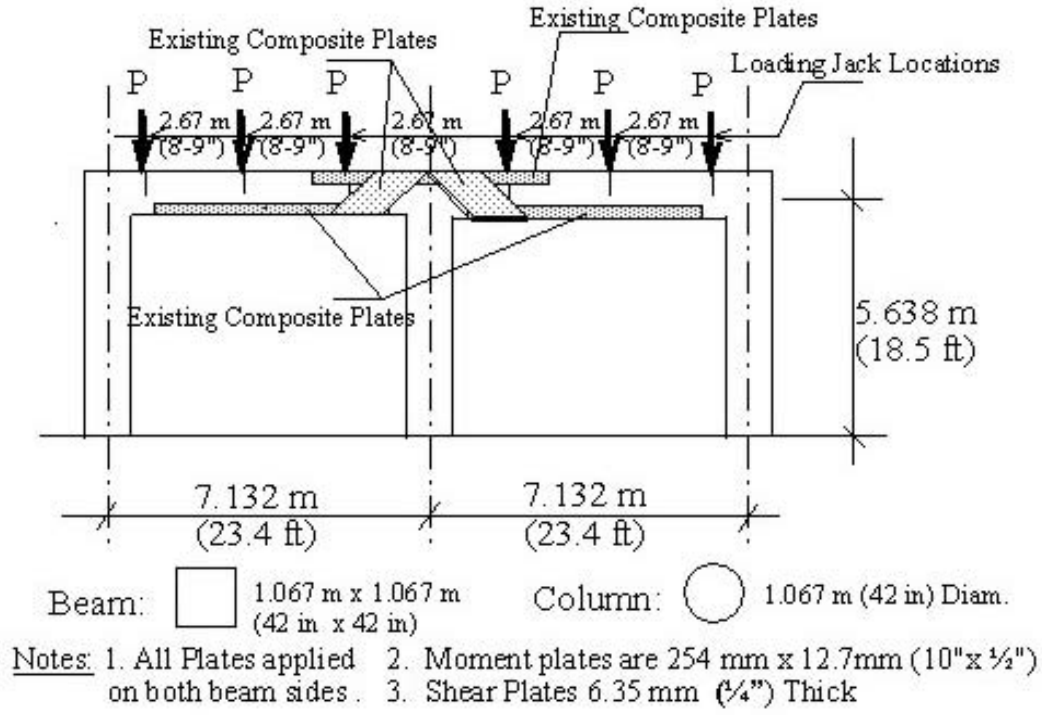

Figure 4. Capbeam at Pier 2 load application locations P=2670 KN (600 kips).

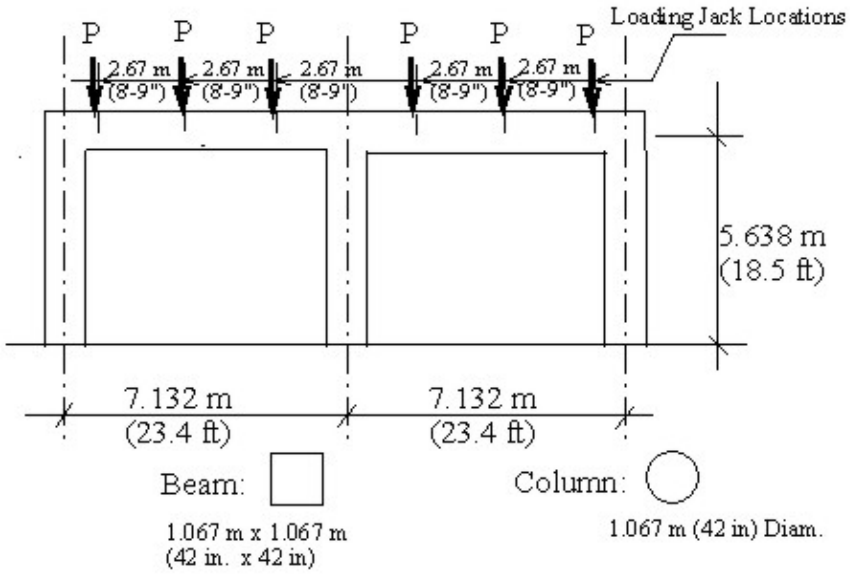

Figure 5. Capbeam at Pier 3 load application locations P= 2670 KN (600 kips).