High Risk Construction Oversight Study (HRCO) Implementation

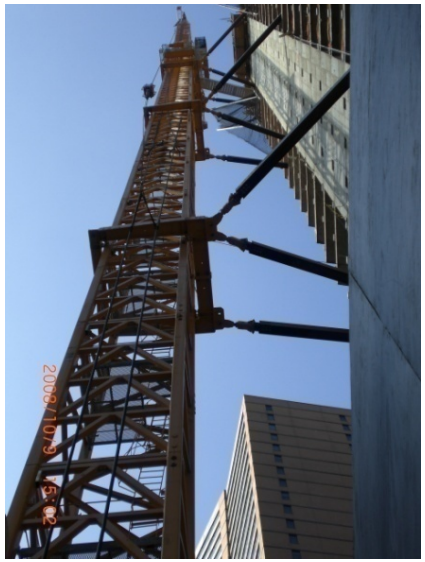
Crane Industry Meeting

February 23, 2010

Overview

Cranes

Foundations



Tie-Ins

Overview

Cranes

Load Test

Counter Weights

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Foundations - Observations

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- The current practice in the Jurisdiction is that the foundation is poured with little involvement of the DOB or formal Special Inspection.
- Identified four (4) sites that required excessive shimming of anchor stools and/or enlarging/elongating the bolt holes to affix the tower mast to the foundation.
- At one site, the contractor attempted to epoxy dowels in “green” concrete without consulting epoxy manufacturer.
- Anchor Stool template made of non-rigid material (one was made of ½” plywood)

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Foundations - Observations

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Foundations - Observations

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Foundations - Observations

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1) Foundations
   A) Pre-pour approval
   B) Use of first tower section as template or rigid template
   C) OEM Anchor stool
   D) Special Inspection Report
   E) Qualifications of inspectors
   F) The foundation should be kept clear of debris

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Tie – In - Observations

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- Tie-in design and material requirements as shown in plan drawings differed from tie-in installations on site (i.e., one site design called for 8,000 psi and the installation had 5,000 psi).
- Incomplete notes in CN drawings (i.e., procedures during high winds).
- Loose slab connection bolts on friction connection designed tie-ins and one occurrence of actual tie-in movement.
- Weld missing on the tie-in strut to the anchor plate

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Tie – In - Observations

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- The crane drawings are typically not signed off by the building Engineer of Record.
- This is important so the building engineer may verify that the building is able to absorb the additional forces introduced by the crane

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Tie – In - Observations

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Tie – In - Observations

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Tie – In - Statistics

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Observations	Checked	Observed
Tie-in installation differed from design	2	2
Loose connection bolts on Friction connection	21	3
Building Engineer or independent PE agreed that the building could withstand the additional forces	13	3

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2) Tie-ins

A) Types of connections (friction and bearing)

B) Complete climbing configuration included with certification of on-site application

C) Building Engineer review of forces imposed (steel and concrete buildings)

D) Special Inspection Report

E) Qualifications of inspectors

F) Torquing of bolts or other means of pre-tensioning the connection

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Load Test – Observations

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- Reviewed load test procedures issued by Professional Engineers where the crane could have potentially lifted a test load exceeding the maximum allowable weight (one by 50% and the other by 36%).
- The above procedures did not prescribe a moment or gear load test.
- ANSI B30.3 and B30.5 guidelines say the test should not exceed 110% using a freely suspended load
- Manufacturers agree that the crane should not lift more than 110% of the rated load (one said it should not be over 100%).

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Load Test - Statistics

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Issue	CN's Checked	CN's with issue
Crane could have lifted more than 110%	13	5
Procedures on CN's that did not have a moment test	13	3
The procedure includes a line pull test on all gears	13	2

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Load Test - Observations

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Load Test - Observations

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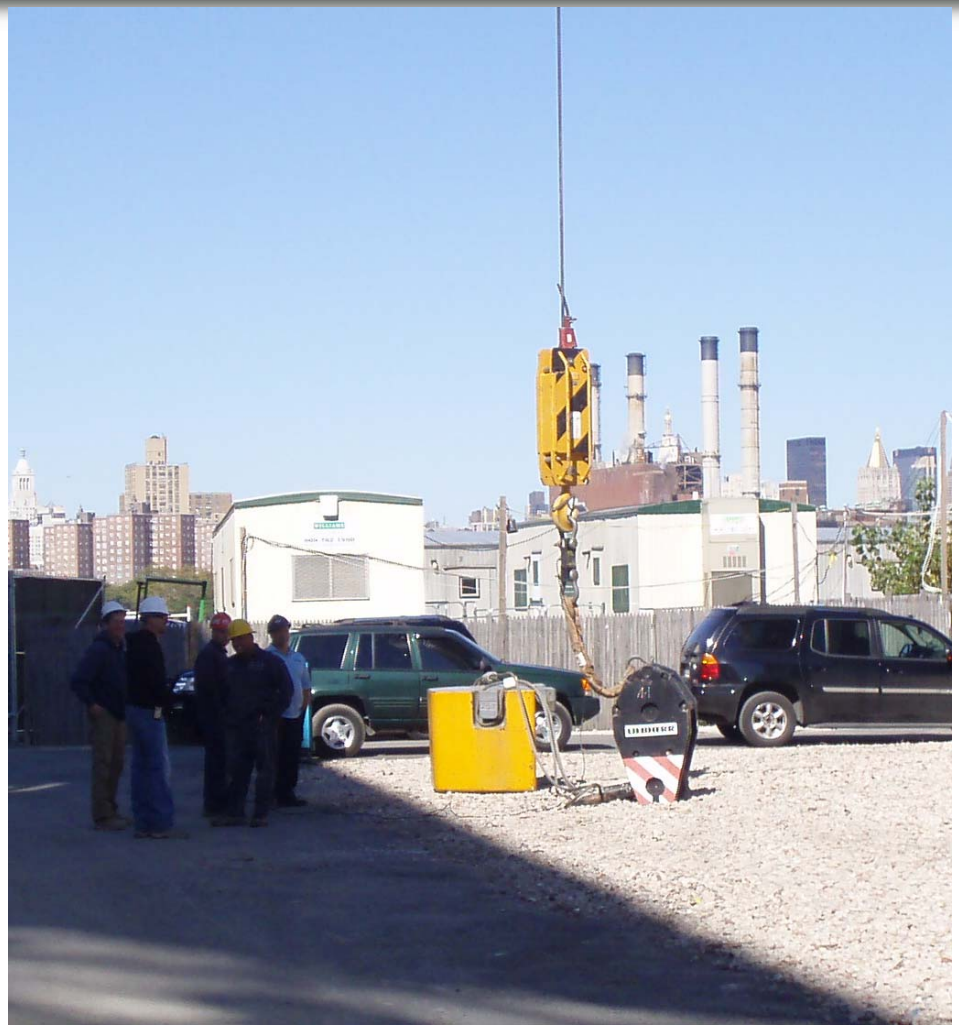

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Load Test - Observations

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3) Tower crane load test procedures must contain

A) The submitted procedure must not overload the crane at any time and be in accordance with the manufacturer's requirements.

B) Line pull test on all gears (additional test weights may be required) (remote or manually shifted gears)

C) A moment test should be performed as a standard practice for all load tests.

D The test procedure should include testing all limit and pre-limit switches and brakes.

E) Abbreviated test after each climb (functional only)

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Counter Weights – Observations

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Counter Weights – Observations

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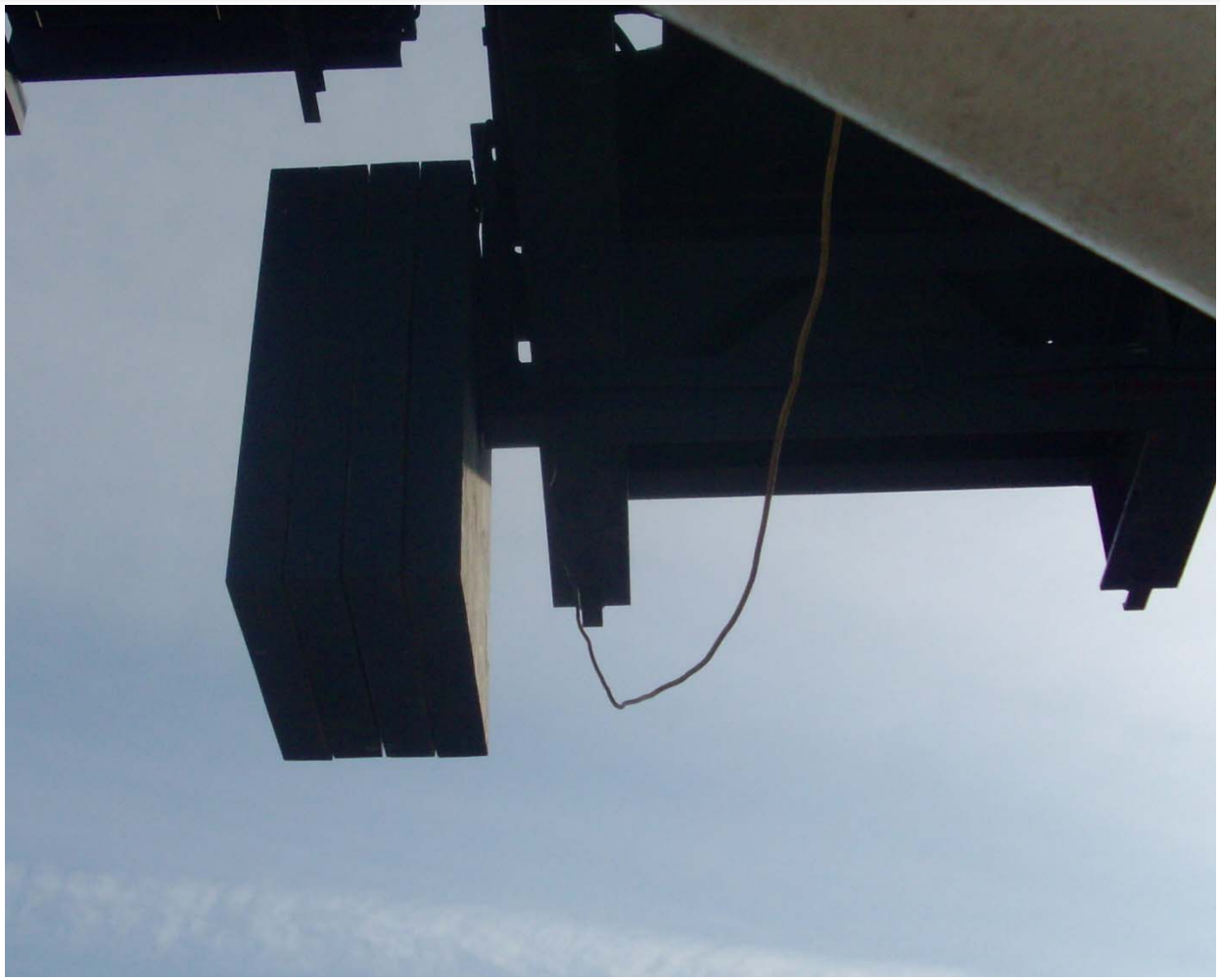

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Counter Weights – Observations

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Counter Weights - Observations

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Investigation Type	Number of Investigations	Issues / Exceptions
CN's reviewed that did not have counter weight configurations	20	20
Counter weights without markings visible while in place on all weights	15	14
Movable counter weight mechanism requiring maintenance	34	5

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Counter Weights – Observations

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Counter Weights – Observations

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- HRCO team found signs of poor maintenance or corrosion on the movable counter weight mechanism.

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4) Counterweight marking

   A) The crane engineer of record to include the counter weight configuration (weight and location) in the Certificate of on-site.

   B) Markings

      i. Each module to be clearly labeled and easily read from either the machine platform or the ground when installed

      ii. The numbers should be on the each side of the module

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C) If the hanging counter weights are concrete, they should be framed in steel or other means that prevents the modules from chipping or breaking.

D) Counterweight moving mechanisms must be maintained in a “like new condition”.