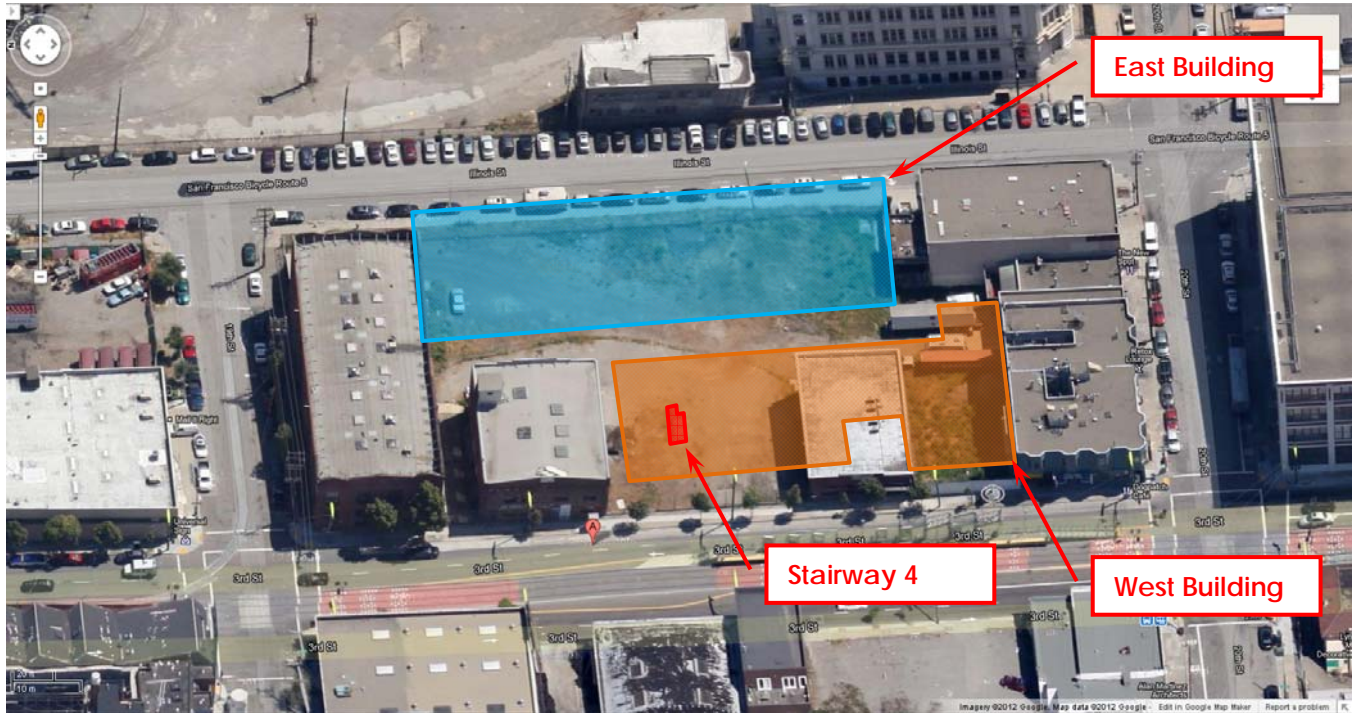


Memorandum

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From: W. Charles Perry
Date: October 24, 2012
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Re: Preliminary Summary – Cal-OSHA files and regulations, codes & standards.

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A. Location of Incident - 2235 3rd Street, San Francisco, CA; west building; 6th floor & roof; stairway 4.



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B. Date & time of incident – August 31, 2011 @ 7:58 AM

C. Sequence of Events

1. 12/8/09 – Project Permit from CA DIR to Nibbi Brothers
2. 1-15-10 – Plan set approved by SFDBI
3. 2-11-10 – Construction begins per Project Permit
4. 1-11-11 – Design & Supply Proposal from Aluma Systems to Nibbi Brothers Concrete; CA PE stamped & signed plans included.
5. 8-1-11 – Shoring plans completed by Aluma Systems; no design change or detail for shoring roof (level 7 on plans) above open stairway 4 floor at level 6; stamped and signed by Daniel Keith Bogue, CA Civil PE, resides in Waddell, AZ.
6. 8-30-11 – Shoring on 6th floor for roof forms completed by Nibbi Concrete (Nibbi Brothers Construction?); inspected and approved by Bob Figone at Nibbi Concrete, J. Lee at Nibbi Brothers Construction, and Robert Hardy at Aluma Systems; Nibbi (Brothers / Concrete?)-Owned Patent Pro Shore equipment spanned from Aluma Systems Equipment to ledger on shear wall adjacent to stairway 4 and spanning over open stairway at level 6; open stairway 4 at level 6; stairway at level 5 spanned by 5 Aluma beams and plywood designed as floor opening cover only; beams span 12 ft direction of ~8 ft by 12 foot stairway opening.
7. 8-31-11
 - a) 3:00 AM – pouring of concrete on 7th level / roof begins
 - b) ~7:30 AM – ~ 270 (?) yards out of 330 yards of concrete placed; Hernandez (pour watch) notified by finisher that concrete over stairway 4 dropped 4 inches.
 - c) Hernandez goes to level 6 to inspect cause of problem and installs an additional brace under shoring. Hernandez asks Templeton for help.
 - d) Templeton goes to 6th floor and notices that ledger on shear wall at roof that supports Patent Pro Shore equipment is pulling from wall and allowing forms to drop. Templeton goes to 5th floor and places a shore from level 5 to sagging beam at level 7 (not clear in OSHA report).
 - e) ~8:00 AM – Ramos notified of problem while working on east building. Ramos gets Castro and goes to west building.
 - f) Templeton & Castro on 5th level stairway cover / platform; use hydraulic jack beneath shore post on top of central Aluma Beam to lift sagging roof forms on level 7.
 - g) Central beam on level 5 fails & platform collapses at 5th level
 - h) Roof collapses and drops concrete, plywood, and shoring on top of Hernandez, Templeton, and Castro; Ramos jumps out of way.
 - i) 8:25 AM – Cal-OSHA notified
 - j) ~9:00 AM – Cal-OSHA on site to investigate

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8. 9-2-11 – Shoring plans for roof over stairway 4 prepared by Aluma Systems and stamped and signed by Daniel Keith Bogue, CA Civil PE.
 9. 9-8-11 – Signed purchase order from Nibbi Concrete to Aluma Systems; CA PE stamped & signed plans included; indemnity from Aluma to Nibbi; no signature by Aluma Systems.
- D. Causes per Cal-OSHA
1. Shoring of roof over stairway 4 “was not engineered and was subjected to a load exceeding its capacity.”
 2. Workers placed a hydraulic jack on work platform beam two levels beneath the failed roof shoring in an attempt to lift it.
 3. “The beam was overloaded and broke in half, causing a catastrophic failure of the platform and upper shoring system resulting in serious injuries to 3 employees and minor injuries to the fourth.”
- E. Aluma Systems claims
1. “The decking / shoring equipment in use at the area of collapse was Nibbi owned Patent Pro Shore and was not adequately shored from below to support the concrete loading”
 2. “Aluma perimeter tables and High Flyer Tables were on site but were not involved in this incident.”
 3. “Aluma did not provide drawings detailing the area of collapse.”
 4. “Following the incident we were asked to provide shoring plan drawings in order to finish the pour safely.”
 5. “Areas at stairways and elevator shafts are not typically detailed on Aluma shoring application drawings.”
 6. “At roof levels, to support the slab over the opening, special design considerations and components are required to span across the opening.”
 7. “In most cases, contractors will provide their own design for these areas based on equipment availability.”
 8. “Aluma will not typically detail these areas unless they are specifically asked to do so.”
 9. “Application drawings for the shoring and formwork systems prepared by Aluma Systems are submitted to the customer for review prior to erecting equipment on site. These reviewed and sealed drawings (by Aluma’s shoring engineer) are in turn submitted to the engineer of record (structural engineer for the project) for review. The purpose of this review (by the customer and the engineer of record) is to ensure that the shoring layout and the structural elements indicated on the drawings conform to the project documentation and to make any comments and requests for additional information / clarification pertaining to the shoring design drawings.”

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10. "For this particular projects [sic], Aluma's drawings were submitted to the customer for review and Aluma was not requested to provide the design for the shoring at stair #4."

F. Codes and Standards

1. CA Building Code, Section 1906.1 Formwork: "The design, fabrication, and erection of forms shall comply with *ACI 318, Section 6.1*

2. *ACI 318, Section 6.1 Design of Formwork*

a) 6.1.1 – "Forms shall result in a final structure that conforms to shapes, lines, and dimensions of the members as required by the design drawings and specifications."

b) 6.1.2 – "Forms shall be substantial and sufficiently tight to prevent leakage of mortar."

c) 6.1.3 – "Forms shall be properly braced or tied together to maintain position and shape."

d) 6.1.4 – "Forms and their supports shall be designed so as not to damage previously placed structure."

e) 6.1.5 – "Design of formwork shall include consideration of the following factors:

(1) a. Rate and method of placing concrete:

(2) b. Construction loads, including vertical, horizontal, and impact loads;

(3) c. Special form requirements for construction of shells, folded plates, domes, architectural concrete or similar types of elements."

3. ACI 347-04 Guide to Formwork for Concrete

a) 1.4 "The layout and design of the formwork and its construction should be the responsibility of the formwork engineer / contractor."

b) 1.4.4 "Although the safety of the formwork is the responsibility of the contractor, the engineer / architect or approving agency may, under certain circumstances, decide to review and approve the formwork, including drawings and calculations. If so, the engineer / architect should call for such review of approval in the contract documents."

c) 2.1.5 ... "The review, approval, or both of the formwork drawings does not relieve the contractor of the responsibility for adequately constructing and maintaining the forms so that they will function properly." ...

d) 2.2.4 ... "Form designers should provide for special loading conditions, such as walls constructed over spans of slabs or beams that exert a different loading pattern before hardening of concrete than that for which the supporting structure is designed."

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e) 3.1 "Contractors should follow all state, local, and federal codes, ordinances, and regulations pertaining to forming and shoring. ... Attention to safety is particularly significant in formwork construction that supports the concrete during its plastic state and until the concrete becomes structurally self-sufficient."

f) 3.1.1 "Some common construction deficiencies that can lead to formwork failures are: ... failure to construct formwork in accordance with the form drawings."

g) 3.6.2 " ... Form watchers should always work under safe conditions and establish in advance a method of communication with placing crews in case of emergency."

4. ACI 347.2R-05 Guide for Shoring / Reshoring of Concrete Multistory Buildings

a) 4.5 "Forms, shores, and reshores comprising the formwork system should be adequate to carry the applied construction loads. ... Inspection is recommended and is required in some jurisdictions before concrete placement, and shoring / reshoring drawings should be available at the site at all time. No worker should be directly under the forms during concrete placement, unless required to adjust the shores / reshores and forms."

G. Potential Issues

1. Was the absence of a separate shoring plan for the roof that provided special accommodations for openings in the floor below an error or omission by Daniel Keith Bogue, CA Civil PE
2. Was the absence ... ditto ... a violation of the California Building Code?
3. Was the absence ... ditto ... a violation of the contract between Nibbi Brothers Concrete and Aluma Systems?
4. Did the Structural Engineer of Record assume responsibility for Daniel Keith Bogue's shoring plans if he reviewed and approved them?
5. Did Nibbi Concrete assume responsibility for Daniel Keith Bogue's shoring plans by accepting them, using them, or designing & building their own shoring over stairway 4 where Mr. Bogue's plans did not exist?
6. Did Aluma Systems assume responsibility for Nibbi Concrete's design & construction over stairway 4 by inspecting and approving it?
7. Did Nibbi Brothers assume responsibility for Nibbi Concrete's design & construction over stairway 4 by inspecting and approving it?
8. Was Nibbi Concrete's shoring design over stairway 4 adequate and the failure due to defective construction?
9. Was any such defective construction apparent in a visual inspection?
10. Was Nibbi Concrete's shoring design over stairway 4 inadequate?

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11. Was any such design inadequacy apparent in a visual inspection?
- H. Possible future tasks
 1. Obtain and review a complete set of plans & specifications plus related contract documents for the building that are clear and legible
 2. Obtain and review a fully executed contract between Nibbi Concrete and Aluma Systems
 3. Obtain and review a complete set of shoring plans that is legible.
 4. Obtain & review witness statements
 5. Obtain & review accident reports & photographs prepared by Nibbi Brothers, Nibbi Concrete, and Aluma Systems.
 6. Obtain & review photographs prepared by Cal-OSHA investigators
 7. Obtain & review daily inspection report and daily photographs by Nibbi Brothers, Nibbi Concrete, and Aluma Systems.
 8. Determine actual configuration of shoring over stairway 4 supporting roof
 9. Determine actual configuration of work platform over stairway 4 opening at level 5 plus reason for absence of such platform at level 6.
 10. Determine what type of shore was installed by Hernandez after partial collapse at level 6 & how it was installed.
 11. Analyze design capacity of shoring over stairway 4.
 12. Inspect, document & analyze the failed shoring components and related floor covers & beams. Determine failure cause and load.
 13. Determine if the structural engineer of record or architect of record reviewed and approved shoring plans or was required to do so by contract.
 14. Determine if the shoring plans were prepared under the direct supervision of Daniel Keith Bogue.
 15. Obtain and review the shoring calculations by Daniel Keith Bogue that support his design as shown on the plans
 16. Reconstruct the accident graphically
- I. Potentially Interested Parties
 1. Owner: Martin McNerney Properties, 14 Mint Plaza, Fifth Floor, SF, CA 94103
 2. Architect: HKS, 500 Howard St., SF, CA 94105
 3. Structural Engineer of Record: Nishkian / Menninger, 1200 Folsom St., SF, CA 94103
 4. Shoring Engineer: Daniel Keith Bogue, 18010 W. Griswold Rd., Waddell, AZ
 5. Contractor: Nibbi Brothers Associates, 180 Hubbell St., SF, CA 94107
 6. Concrete Subcontractor: Nibbi Concrete, 23990 Jerrold Ave, SF, CA 94124
 7. Shoring Supplier: Aluma Systems, 2915 Sunrise Dr., Las Vegas, NV