SUSPENDED ACCESS PLATFORM COLLAPSE: CHICAGO 2002

This summary note is derived from a paper in (USA) Civil Engineering November 2006 pp52-59, authored by Alec S. Zimmer P.E., A.M.ASCE and Glenn R. Bell, S.E., M.ASCE, which in turn was derived from a paper by the same authors at the 4th Forensic Congress, sponsored by ASCE's Technical Council held in October 2006.

Introduction

In 2002 a suspended access platform fell from the 100 storey John Hancock building in Chicago, USA. Although no-one was on the platform at the time, three motorists were killed and several pedestrians were injured as a result of flying debris.

The subsequent investigations brought to light a series of faults. The City of Chicago amended its statutory requirements as a consequence of the findings. Civil action resulted in some $70M damages in negligence claims.

The access platform

The access platform was being used in a major refurbishment of the curtain walling. It was a bespoke construction, made specifically for this project, but using the permanent dual rails that ran along the roof perimeter (but within its footprint) and provided for the window cleaning gantry. The platform measured approximately 30m long by 1.2m wide.

The scaffold platform was supported by a dual A frame arrangement, running on the two rails, with an out-board outrigger supporting the platform, via cables, and an in-board out-rigger supporting a counterweight.

The unit moved along the rails on roller assemblies which included wheels beneath the top flange of the rail, as a measure to prevent overturning in transit. However, as these rollers fouled the spliced joints in the running rail they were replaced with nominal underside rollers. This change was not reviewed or approved. The platform supplier added wire rope lashing and turn-buckles, attached to the inner rail (where uplift might occur), as a supplementary measure whilst the assembly was stationery.

The platform itself was supported by wire cables and was stabilised by attachment to three of the building's regular mullion tracks by friction clamps and rollers. The rollers provided horizontal restraint, whilst the clamps could be used to give vertical restraint when the platform was stationary. Subsequent changes to the design reduced the number of clamps, and restricted their vertical restraint to upwards movement alone. Despite a requirement that the support cables have no joints, a splice was utilised where the cable passed between the A frames. This was not installed in accordance with the manufacturer's instructions and was found to have less strength than the cable itself.

The assembly was supplied with an operating manual. This stated that whenever the equipment was unmanned for an extended period of time the platform should be raised to parapet level, or lowered to ground level. It went on to say that it should be '*moored up to the*

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parapet…or lowered to the ground when severe weather is forecast. Contractor judgement and experience must determine what is severe'.

Contractual arrangements
These involved a significant number of parties (Figure 1):

PE indicates 'Professional Engineers'. These are state registered.

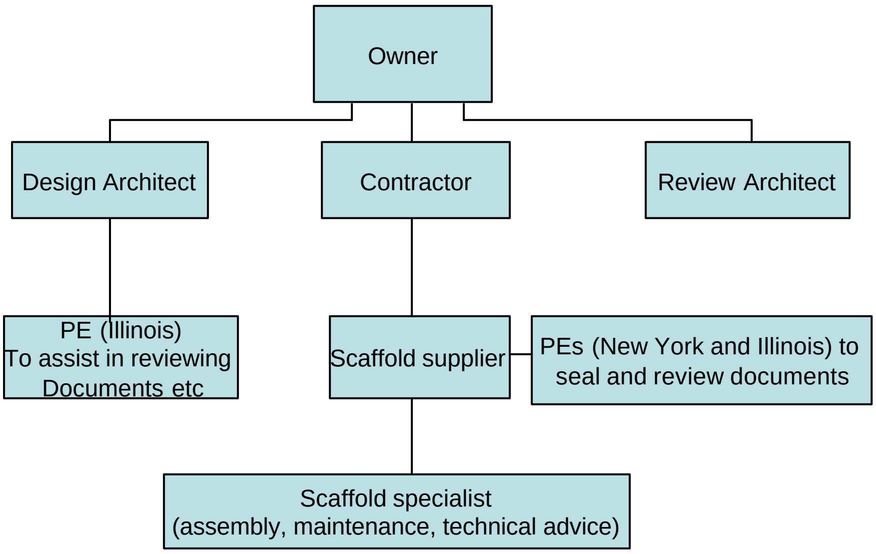

Figure 1: Contractual Arrangements

The accident
Following the last period of work the platform was left at level 42. This had become a habit as, at this level, access was provided in the building through the façade and it also limited the time taken to raise or lower the platform to the location of the work. No work was possible in the following two days due to the high wind level (reaching 90 km/hr gust and sustained speeds of 56 km/hr). During this period of wind-induced downdraft an outrigger broke free and overturned allowing the platform to swing downwards at one end resulting in disintegration, and building damage, when striking the re-entrant corner of the building.

Findings
A very thorough forensic investigation took place following the accident. This showed that failure would probably have been averted if one or more of the following conditions had obtained:

- The original under-flange rollers had been left in place
- The in-board A-frame had been lashed more substantially to the rail
- The platform had been raised to the roof or lowered to the ground as required by the operating manual.
- Independent platform support lines (as required by USA legislation) had been provided.
- The friction clamps had been used.

In addition, the authors make the following comments:

- The scaffolding supplier had no appropriately qualified engineers for a project of this complexity; the design itself contained a number of fundamental errors.
- Lines of communication with the two sealing engineers were confused with the result that a comprehensive review did not occur.
- There were problems throughout the project with unauthorised changes to the scaffold, lack of documentation, failure to comply with statutory requirements (specifically the provision of redundancy in the platform support lines), and omission of tie backs to anchor points on the building.
- There was a known history of 'lift-off' from the in-board rail.

The paper gives a comprehensive explanation of the analysis which was carried out to determine the sequence of events, and of the conclusion that a number of components were under-strength.

These failings were compounded by a series of generic problems:

- Complex and confused communication lines.
- Inappropriate involvement of owner and architect in contractor issues, thus blurring lines of responsibility.
- Pressure on time, scope and fees.

Outcome
The paper indicates that the City of Chicago now requires permits for platforms of this type, training for users and periodic maintenance and inspection of platforms. It also requires that platforms be lowered to the ground or raised to the roof and properly secured when not in use or when high winds are predicted.

Commentary
In GB the provision and use of such assemblies (and their fixings) is governed by the Lifting Operations and Lifting Equipment Regulations 1998. These regulations set out stringent requirements for safe use including certification of safe loads and the inspection and use by competent persons. The Work at Height Regulations 2005 require work at height (which includes access and egress to the workplace) to be 'planned and supervised'. British Standards include: BS EN 1808:1999 Safety requirements on suspended access[1] and BS 6037-1:2004 Code of practice for the planning, design, installation and use of permanently installed access equipment- Part 2: Travelling ladders and gantries.

The Specialist Access Engineering and Maintenance Association (SAEMA) has useful data (http://www.saema.org/about.shtml).

[1] 1 BS 2830 (Specification for suspended access equipment) is to be revised so that it covers steeplejack seats only; it currently conflicts with EN 1808

Hence this type of high-risk work is well regulated. Nonetheless, this accident is a timely reminder of the need to guard against:

- complex and confused lines of communication,
- inappropriate involvement of parties,
- unauthorised change.
- failure to follow legislation and agreed procedures
- inadequate time

which are generic 'root' failings applicable to all work scenarios.

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