



Design and Evaluation of Facade Access Equipment for Tall Buildings

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Summary

Access to building facades is necessary for routine maintenance, window cleaning, and repairs. Structural engineers are often asked to design facade access systems for new or existing buildings or to evaluate various facade access equipment. Drawing upon relevant case histories in which dedicated facade access equipment was inspected, tested, and/or designed for a number of high rise buildings, this paper presents key design and evaluation criteria for such equipment, and offers general recommendations and guidance for navigating often-contradictory codes and regulations.

Keywords: facade-access-equipment, OSHA, davits, scaffolding, platforms

1. Introduction

Access to high-rise building facades is required for a wide range of maintenance and construction activities, including window cleaning, window re-glazing, sealant repairs and general facade repairs. Facade access was typically not a key design consideration for buildings constructed before the late-1960s. As the overall building inventory has aged and the need for facade access and repairs has increased, many buildings have been retrofitted with new equipment to facilitate facade access. Stringent inspection and maintenance requirements for this equipment often necessitate the involvement and oversight of structural engineers.

2. Codes and Regulations Governing Facade Access

Numerous national, state, and local agencies provide regulations that govern facade access in the United States. In brief, national standards, such as those enacted by the Occupational Safety and Health Administration (OSHA), apply throughout the country, while state and local standards (which are in addition to the OSHA standards) vary depending on the local jurisdiction. A brief overview of these standards follows below.

2.1 National Standards

All applicable maintenance and construction operations related to facade access fall under the jurisdiction of OSHA, which operates under a federal mandate to regulate workplace safety and to develop minimum standards for safety nationwide. Beyond OSHA, there are several other national standards that apply to facade access, but they are known as “reference” standards—that is, they are not legally binding unless they are referenced by another governing code or standard.

2.2 State and Local Standards

Some jurisdictions, such as the State of California, have their own unique standards and requirements for facade access. Sometimes, significant conflicts can arise between the relevant national and local regulations, and the lack of a clear hierarchy between the various documents can make compliance quite complicated.

2.3 Applicability of Various Standards

The applicability of the numerous standards related to facade access equipment can vary significantly from city to city and even from building to building in the same city. A careful reading



of all national and local standards is required when evaluating facade access methods at a particular building.

3. Common Facade Access Equipment and Design Requirements

Various types of equipment can be used to access building facades. Powered platforms, commonly referred to as suspended or swinging scaffolds, are perhaps the most common type of facade access equipment. They typically consist of two or more wire ropes supporting an aluminium-framed work surface that can be raised or lowered by hoists. Powered platforms are almost always suspended using wire ropes varying from 8 mm to 13 mm in diameter. Rope descent systems, more commonly referred to as boatswains (or bosun's) chairs, are typically non-powered assemblies consisting of a small platform for a single worker that can be lowered at a controlled speed and stopped at work stations on a building facade. Platforms and rope descent systems can be suspended from a variety of supports, such as davits, outrigger beams, or house carriages located on the building roof. Platforms are usually required to have some measure of protection against swaying induced by wind forces. Generally, each worker accessing a building facade must have a fall arrest system consisting of a full body harness, lanyard, and rope grab secured to a lifeline that will safely suspend the worker in the event of a fall.

While many of the provisions in the various codes and standards are very similar, there are several instances in which the standards prescribe different requirements or are even in direct conflict. In some cases, various OSHA regulations appear self-conflicting.

4. Inspection and Testing Requirements for Facade Access Equipment

OSHA requires equipment dedicated to a particular building to be tested before being put into service. The requirements clearly state that such testing shall, "...determine that all parts of the installation conform to applicable requirements of this standard..." Where the "parts" in question are structural elements, conformance with applicable requirements requires testing to the specified minimum loads. Unfortunately, some standards indicate that testing should be limited to a fraction of the required strength. While these standards do not take precedence over OSHA provisions, they are being used more and more frequently as a testing reference for those commissioning new systems. After the initial testing and inspection are complete, equipment must undergo routine monthly and yearly maintenance inspections to verify its continuing adequacy. In general, maintenance inspections involve review of structural, mechanical, and electrical components of the facade access equipment. Structural testing of facade access equipment is often necessary to verify continued conformance to minimum structural requirements. Years of use and exposure to the environment can adversely affect the strength of structural components such as davits, davit bases, and anchorages.

5. Common Retrofits and Repairs to Facade Access Equipment

Many older high-rise buildings were constructed without significant consideration of exterior facade access. Current owners of these older buildings often struggle to provide safe and reliable means for contractors to access their facades for window cleaning and facade maintenance. In many cases, retrofits or new equipment are necessary to comply with current code requirements. Guidance from a licensed professional engineer is almost always required when changes to facade access systems are considered.

6. Conclusion

The various codes and standards that govern facade access in the United States can make it difficult to interpret applicable requirements for a particular building. In many instances, the regulations contradict each other or put forth incongruous provisions that further complicate the design and evaluation of facade access equipment. As such, the need for professional engineering services in developing and maintaining safe and economical means for facade access is clear and growing.