Summer 2003

# Facility Facts

FACILITY ENGINEERING ASSOCIATES INFORMATIONAL NEWSLETTER

Volume 11 Number 3

## Suspended Platforms – A Complete Plan is Critical

*By Jim Justus, P.E. and Les ZumBrunnen, P.E.*

Boston, MA, two window washers fall to their deaths. Preliminary investigations indicate improper anchorage of their temporary suspended platform lines and life safety lines to rooftop equipment. Newark, NJ, a waterproofing contractor falls to his death while moving suspended scaffolding from one location to another. He had temporarily unhooked his fall protection device to accomplish the move. Minneapolis, MN, a worker was killed when his permanently anchored suspended platform failed at one end. He had failed to tie his fall protection line to the appropriate anchorage at the roof. His partner in the platform is seriously injured, as he tied his harness to the scaffolding. In all cases, even though the deceased was found during investigation of the accident to have substantially contributed to their own deaths, the building managers and owners were sued by family members and either settled or lost each case. In all cases, the building managers and owners were cited by OSHA as not being in compliance with the regulations. Why were the building managers and owners targeted? Because they did not have the proper plan and certifications for operating suspended platforms from their buildings.

*Suspended weight with dynamometer scale to load test davit arm*

Primary regulations concerning suspended platforms are contained in OSHA Standards 24CFR1910.28 covering suspended platforms, 29CFR1910.66 covering personal fall protection standards, and the American National Standards Institute (ANSI) and the International Window Cleaning Association's I-12.1-2001 "Window Cleaning Safety." Specific jurisdictions such as the States of Washington and California and the City of New York have additional, more stringent requirements. These documents represent the minimum standard of care for building management and ownership, and serve as guides for building management and ownership. To summarize the documents:

1. All devices used to secure, tie, anchor, or support equipment or personnel utilized to access building facades 48-inches or more above the level below are covered by the standards.
2. For all buildings that require personnel to access building façades via equipment suspended from roof/balcony levels, permanent fall protection anchorages must be provided by the building.
3. All devices permanently dedicated to the building shall be maintained by the Owner and shall be designed and certified for use by a licensed professional engineer, inspected annually by a qualified person, and inspected prior to each use by a qualified person.
4. All devices temporarily used on a building by a vendor must also be designed, tested, and certified by qualified personnel prior to use.
5. The owner of the equipment shall maintain a record of each certification and annual inspection.

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## Geophysical Tools for Investigating Old Mine Sites

*By Paul G. Swanson, P.E.*

Sometimes the history of an area can have profound effects on development. Recently, FEA performed geotechnical exploration studies for a proposed residential development along the James River in Richmond, Virginia. The Richmond area was an important coal producing area from the late 1700's through the early

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## Suspended Platforms – A Complete Plan is Critical — *continued from page 1*

6. The owner of the equipment shall maintain records of the use of the equipment.
7. The building shall provide to all users written procedures for the operation, safe use, and inspection requirements for all systems provided by the building.
8. Prior to the performance of work, the contractor shall develop and provide to the Owner, a Plan of Service for the building that outlines how the contractor intends on accessing the building façade, including any moves required by the equipment.

How do these rules affect a building manager/owner? They stipulate that permanent fall protection anchorages must be provided on the building, permanent systems must be load tested and certified, and that a Plan of Service must be developed and maintained for the building.

Currently, a large percentage of the low- to mid-rise buildings found in the United States do not have designated fall protection anchorages. Both the ANSI and OSHA standards require the retrofit of buildings to provide designated fall protection anchorages, capable of supporting a minimum of 5,000 pounds per attached employee. In many cases, other structural elements are present on the roof that can be designated as a fall protection anchorage with the assistance of a structural engineer. **However, a single anchorage cannot be used at the same time as both a primary support for a suspended platform and as a fall protection anchorage.** If the suspended platform line is anchored to a davit on the roof, the base of the davit cannot be used to anchor the life safety line for any individual on the platform. The intent of this requirement is to ensure that a failure of an anchorage or line does not result in a failure of both means of support, and subsequent injury or death.

As part of the building manager/owner's responsibility, all permanent system components are required to be load-tested and certified at least once every ten years under the direction of a registered engineer. Further, both periodic and annual system inspections are required to be completed by qualified personnel. The records of these certifications and inspections serve to protect the building manager/owner as they document that the systems provided by the building are structurally, mechanically, and electrically sound prior to the use of the systems by personnel.

*Load test of davit and tie back on roof with dynamometer scale*

The Plan of Service is intended to adhere to all these guidelines. As outlined in the ANSI standard, the "Plan of Service" is intended to be a well-thought out document that outlines how the contractor plans on using the existing permanent systems, what temporary systems will be brought to the site, contractor inspection and emergency procedures, fall protection locations, identification of hazards for both employees and the public, as well as other important, site specific requirements. The plan can be prepared by the window-cleaning firm, consultant, or engineer and approved by the building manager/owner.

By providing adequate, certified fall protection anchorages, and developing a full Plan of Service, a building manager and owner can ensure they comply with the minimum standard of care for use of these types of systems, and minimize the potential for costly litigation. FEA has worked with multiple building managers and owners across the country checking buildings for compliance, designing new/retrofit systems, and load testing and certifying various systems, including davits, outrigger arms, tie backs, multi-line systems, and others. We can work with your existing contractors to certify the systems and develop the Plan of Service. For review, certification, or inspection of your system, or for assistance in managing the risks associated with suspended platform systems, contact Jim Justus at 864-787-3903 or jim.justus@feapc.com or Les ZumBrunnen at 303-984-7300 or les.zumbrunnen@feapc.com.

## About Facility Facts

Facility Facts is an informational newsletter issued quarterly by Facility Engineering Associates' staff to share innovative techniques, case studies, trends and general information on issues important to our clients.

Facility Engineering Associates is a national consulting engineering practice specializing in existing facilities and infrastructure. Our expertise is in the areas of:

- Condition Assessment
- Facility Management
- Repair, Restoration and Instrumentation
- Geotechnical and Environmental Engineering Services

These articles are for general information only, and may not fit your specific situation. If you would like to reprint an article or would like more information about a specific challenge you face, please call:

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## Geophysical Tools for Investigating Old Mine Sites — *continued from page 1*

1900's. Surface and subsurface coal mines were developed primarily by hand often with slave labor. The mine sites involved large areas and could extend hundreds of feet below the ground surface. Documentation of the mining activities is scattered and often more anecdotal than factual.

Surface features that evidence previous mining activities include mounds of coal waste, rock, soil, and rubble presumed to be spoils discarded during the mining process. There are also isolated depressions at the ground surface. These are "cone-like" depressions, that vary in size and depth, and are scattered throughout the mining area. These pits can be 20 to 40 feet in diameter and as much as 20 feet deep. Because of their age, these features can support large trees and blend into the natural features of the forest.

*Figure 1 - Typical Surface Conditions Around Abandoned Mine Pit*

Associated with these surface features is the potential for settlement of the ground surface due to collapse of subsurface mine shafts. Agencies such as the Bureau of Mine Reclamation have developed standard practices for the reclamation of surface mine features such as these abandoned mine pits.

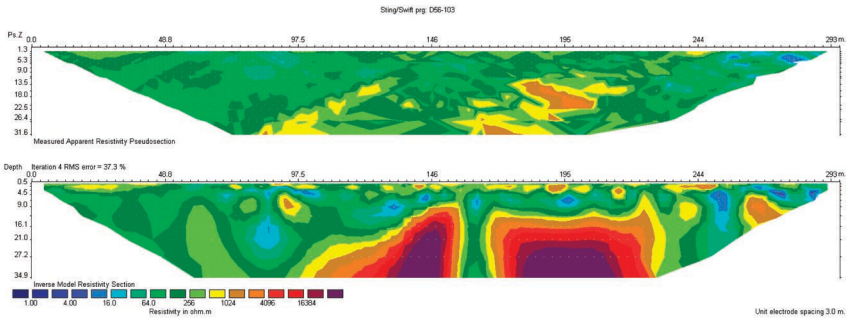


*Figure 2 - Subsurface Profile From Resistivity Survey*

However, the investigative tools available for determining the presence or absence of subsurface features is still limited.

The standard investigative approach has been soil borings drilled at sufficient frequency to assure the stability of the area supporting structures. The subsurface information obtained from the borings can be correlated with known geologic data such as the strike (orientation) and dip (inclination) of the coal beds. The problem with this approach is that the cost of drilling is high enough to prevent adequate coverage of the area to be developed.

FEA recently used resistivity techniques in combination with soil borings to improve on the delineation of mines hidden in the subsurface. The technique involves the measurement of the apparent resistivity of the earth. An electric current is applied to the ground via two electrodes and the potential difference created at the surface is measured between two other electrodes. The end result is a resistivity profile along which the change of resistivity values can be used to determine what type of rock/soil/voids occurs at the different locations in the ground. Figure 2 is an example of the type of cross section that can be developed from this technique. The advantage is a more continuous "look" of the subsurface conditions, which allows for better interpretation across the area to be developed.

In the case of the residential development in Richmond, the resistivity surveys, in conjunction with soil borings and geologic maps of the area, helped delineate areas within the development that could not be constructed upon without further study. This allowed the developer to create site plans utilizing areas with severe mining impacts for green space. Development of the remaining areas of the site will proceed in advance of further studies and provide income to defray initial development costs.

Geophysical evaluations are an important tool to establish the history of your property in an effort to anticipate potential geotechnical occurences, such as significant ground settlement. To learn more about this project, or about geophysical evaluations, contact Paul Swanson at 703-591-4855, or swanson@feapc.com.

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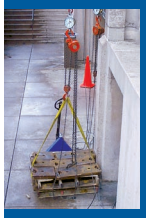



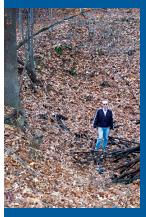



## FEA Highlights

**James D. Baker** has joined FEA in Fairfax, VA as a Staff Engineer in the Repair and Restoration Group. Mr. Baker has just graduated from Pennsylvania State University's five-year ABET accredited professional degree program in Architectural Engineering.

**Christopher B. Wells** and **Kevin C. Moulton** have joined FEA in Fairfax, VA as Staff Engineers in the Condition Assessment/Facility Management Group. Mr. Wells and Mr. Moulton have just received degrees in Facilities Management from Brigham Young University.

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