

# BETTER BUILDINGS

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## Pressurization Alternatives Deserving of Complete Study

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New York City's fire safety ordinance for high-rise office buildings (Local Law 5) requires owners to make substantial physical and operational modifications to their buildings. Installation of elevator recall buttons, fire alarm and communications equipment and the development of fire safety plans are some of the requirements which apply to all new buildings and the 820 existing buildings which are over 100 feet in height. The most expensive task facing New York City building owners, by far, is Phase II of the law which requires either complete sprinklerization of the building, or alternatively, floor compartmentation and pressurization of all interior stairwells.

While the two approaches are considered equivalent methods of complying with the law, they actually address different problems. Compartmentation/stairwell pressurization is aimed at slowing the spread of the fire and providing a smoke-free refuge in the stairwells for tenants and firefighters. This access is available as soon as smoke detectors are set off. Under normal circumstances, pressurizations systems are inactive.

On the other hand, sprinkler systems are designed to actually repress fires, but they may not provide relief from smoke and toxic fumes which are the primary cause of injury and death during fires. Since sprinklers are not activated until temperatures at the sprinkler heads reach 165° or higher, a smoldering fire can produce a large amount of smoke before the sprinklers begin operating. For an owner trying to decide which option to choose, there are no simple answers; each alternative has unique advantages and drawbacks.

Sprinklerization is probably the clear choice for new construction but its cost in retrofitting existing buildings is about \$2-\$3 per square foot or more by the time all costs are included. For an actual 630,000-square-foot building with 50 floors and two interior stairwells, estimated costs are \$1,260,000 for sprinklerization as compared with \$350,000 to pressurize the stairwells. Installation of a sprinkler

system often entails disruption of building routine since ceilings must be removed in each tenant's space as the sprinklers are installed.

As an alternative to both complete sprinklerization and stairwell pressurization, Edward Riguardi, executive vice president of Williams Real Estate Co., Inc., has suggested the concept of partial sprinklerization. Under such a design, the elevator lobbies, certain corridors and particularly the freight elevator lobbies would be sprinklered. Selection of these areas for sprinklerization is in response to New York City Fire Department experience that the majority of office building fires, most of them minor ones, begin where refuse is temporarily stored by the cleaning staff.

### City Rejects Mix

Unfortunately, when presented with the proposed design, the City's Building Department rejected it on the ground that Local Law 5 requires complete sprinklerization. However, I believe that this is certainly an approach that is worth exploring further with municipal officials, particularly in those buildings where stairwell pressurization is not practical due to inherent physical conditions.

In existing buildings, compartmentation/stairwell pressurization offers a less expensive method for complying with the law, but not without complexities of its own. Floor compartmentation is reasonably straight-forward and most buildings are complying with this requirement. Pressurizing stairwells requires the installation of one or more fans which, when activated by smoke detectors in the building, will feed air into interior stairwells in sufficient quantities to keep smoke out under most conditions while not creating a pressure that restricts the doors from opening.

The design and installation of a stairwell pressurization system poses two general problems: proper placement of fans and ductwork, and proper controls. Fan placement is a site-by-site process of determining at which floor levels the fans must be placed to insure an air supply to the stairwell which will provide pressurization. In some cases, engineers discover that convenient locations for the fans and ducts are difficult to establish, although the in-

conveniences incurred are rarely on the order of sprinkler installation. The cost and complexity of the design is dependent upon the number and location of the stairwells, the air tightness of the stairwells, and certain architectural details.

Difficulties in providing control for pressurization systems center around the law's requirement that the system operate effectively with any combination of up to three doors open. Moreover, the system must respond to any changes, which requires well-planned controls. The typical method for providing control is with a series of "barometric dampers" which must be adjusted carefully by the contractor before the system begins operation. Barometric dampers require routine maintenance over the years to insure that they are neither out of calibration or stuck in one position.

In our view, a much improved and reliable method for controlling stairwell pressurization is with micro-processor-based pressure sensors and motorized dampers. Not only does this type of approach establish more precise control, but pressure readings at different points in the stairwell can be monitored remotely on a control panel. This is useful for general monitoring of the system and for the Building Department's controlled inspection. Unfortunately, there is an additional cost attached to them, \$60,000-\$65,000 per interior stairwell.

Computers can also facilitate the design of the actual systems. They can substantially decrease the work involved in designing a stairwell system as well as decrease the time needed to balance the system.

Stairwell pressurization has received a good deal of criticism. Traditional thinking may lead a building owner or manager away from considering such a "new" technology, but stairwell designs are being approved and systems are currently being installed and tested. Solutions do exist for most of the problems posed by stairwell installations. Although some buildings are poor candidates due to architectural layout, operators who dismiss the stairwell option out-of-hand may be committing themselves to unnecessary expenditures. □