



NYC Hospital Generator Failure Speaks to Secure Facility Design Issues

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By Rob Margetta, CQ Staff

A generator failure at New York University Hospital that forced patients to evacuate proved to be one Hurricane Sandy-related matter that lit up social media, with users on Twitter and other services asking how such a critical piece of equipment could go down. Experts say there's an explanation: It involves maintenance and building design, and it's more typical than disaster planners would like.

One of the hospital's trustees went on Bloomberg Television on Tuesday, saying the hospital is undergoing a \$3 billion renovation that included work on the generators, which were not state of the art in design or location. Although building owners and architects have actively pursued the idea of hardening structures against attacks and other disasters and making them more resilient, time and cost are always a factor, according to Barbara Nadel, an architect who has worked on secure designs for the State Department and other entities.

"If we're talking about a hospital in Manhattan, most of them are old and have been there a long time," said Nadel, who owns a firm in New York and is a member of the American Institute of Architects. "I suspect that when they were first built, the mechanical rooms were put in the basement."

In a hospital, like most non-residential buildings, the first floor is prime real estate. It can hold waiting rooms and offices. The upper floors go to patient rooms and treatment centers. Mechanical equipment goes into the basement, for a number of reasons.

Large generators are heavy, can cause vibrations, require regular refueling and maintenance, and can leak, all of which makes them cheaper and more efficient to put at or under ground level, said Tom Hurd, president of the firm Spatial Designs and another AIA member. Designers can put them underground, away from a building or on the side of the building in a shelter graded to protect them from tornadoes and other storms.

But in a crowded city like Manhattan, where space is hard to come by and construction to an existing structure is costly and laden with red tape, the basement is a common solution, Nadel said, and basements flood. Most facilities have some kind of protection against flooding. But NYU Hospital, which is located near water, likely never expected the kind of deluge it received from Sandy.

"They may have had some flooding in the past, but never to this extent," she said, adding that the hospital's age didn't help. "I think years and years ago, when these buildings were designed and built, they didn't think about it. Most of them were designed for 20-, 30-year floods. No one's talking about a 100-year flood."



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Page 2

To some extent, risk management comes into play when designing critical infrastructure, she said; facilities can only be built with a reasonable swath of disaster scenarios in mind. Fiscal realities also come into play: The basement is often the most logical place for generators. But some smart choices can make all the difference, she said.

One of Nadel's areas of research in secure design includes the 1993 bombing of the World Trade Center, which involved an explosives-laden van detonating in the parking garage under the North Tower. What inspectors found afterward, she said, showed how the building's design left it vulnerable in emergencies.

"When they went back and looked at it . . . the Port Authority had located two generators, side by side, in a lower level of the parking garage at the World Trade Center," she said. When the garage collapsed, it crushed both of them, and the water supply."

Redundancy and locating generators in remote locations, or having separate units in multiple areas of the buildings, or putting backups away from the main units, can keep a building functioning even in a disaster of unforeseen proportions, Nadel said.

The problem isn't one limited to hospitals. The Coast Guard has its headquarters in Southwest Washington, near the Potomac River, which occasionally floods. Those waters have been able to knock the service's backup generators out.

"We had near-catastrophic flooding a few years back when we discovered the building's critical infrastructure, including generators and power lines, . . . were actually in the subbasement and were flooded, and rendered the headquarters inoperative for quite a period of time," Vice Adm. John Currier, head of mission support, told lawmakers in 2011. "Subsequently, money has been spent to harden that site."

Rob Margetta can be reached at rmargetta@cq.com