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Can new rail depot be safely evacuated?

By **LARRY HIGGS** • TRANSPORTATION WRITER • February 28, 2010

Designers of NJ Transit's proposed station to be built 175 feet beneath 34th Street in Manhattan as part of the \$8.7 billion second Hudson River tunnel project say they've tried to prepare for any emergency.

But a safety expert said the research on which NJ Transit engineers based some safety designs is 40 years out-of-date and overly optimistic on its estimates of how fast passengers on a station platform hundreds of feet below street level will be able to evacuate to a safe area.

"If they're using data of that period, they've got a problem," said Jake Pauls of Maryland, an independent consultant on building use, safety and human movement.

His research in the late 1960s formed the basis for current fire safety codes, research he said needs to be done over.

"(Engineer John) Fruin and I said our material should be withdrawn from databases because of the change in the demographic," Pauls said.

That type of research was used by NJ Transit engineers to design a network of stairs, escalators and elevators in the station to meet a standard requiring that everyone on the platform can be evacuated to a place of safety in six minutes. That standard, National Fire Protection Association 130, requires designs that ensure the last person in the station is at the foot of an escalator, staircase or elevator in four minutes, and then, in to a "point of safety" in two minutes.

NJ Transit's proposed deep station will have an upper and lower platform and tracks with a mezzanine level in between them. During an incident, passengers on the two platforms would be evacuated using a total of 28 escalators, 22 extra wide stairways and eight elevators with oversized cars, to a safe zone on the mezzanine, said Arthur D. Silber, NJ Transit's chief of the tunnel project.

In the event of an emergency or incident, the mezzanine is designed to be a "point of safety" to which people can be evacuated until they can be moved to street level.

The mezzanine safe zone is protected by fire doors and ventilation systems designed to bring in fresh air and keep smoke and fire out by pressuring the mezzanine, said David Donatelli, project director for The Trans-Hudson Express Tunnel Partnership.

"Every customer and crew member will be at the foot of an escalator from any point on the platform in four minutes," Silber said. "People anywhere on the station platform will be no further than 325 feet away from an escalator, elevator or set of stairs."

That's based on having a maximum load of 4,000 people on the center platform during the height of peak commuting time. Silber said the platform to mezzanine safety features were over-designed to move people coming off a 12-car train, which is larger than the 10-car trains NJ Transit plans on running into the station.

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But Pauls, who sits on rule-making bodies such as

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the National Fire Protection Association and the Society of Fire Protection Engineers, said the old research was on people evacuating from an office building by walking down. He said new research needs to be done on how long it takes people to evacuate walking up to the surface and has to take current levels of fitness and obesity into account.

Judgment "troubling"

"These engineers are sticking their necks out and doing it with unrealistic optimism," Pauls said. "The engineering judgment has far exceeded the research. It's troubling to me as a professional."

Pauls said he has produced the largest body of work on the evacuation of people on stairs, done primarily between 1969 and 1972.

NJ Transit officials countered that they have used computer programs with recent data to model how different types of pedestrians will move during an emergency, including climbing stairs, said Paul Wycoff, NJ Transit spokesman, after consulting with expert William Kennedy. Kennedy is an engineer who is chairman of the committee that revises NFPA standard 130, which is considered the "gold standard" for fire protection in stations and other railroad facilities.

The station design relied on "multiple sources of data and research," including computer programs that incorporate statistics of how fast various groups of people move, such as children, adults and senior citizens, walking at fast and slow rates, Wycoff said.

In a written statement from NJ Transit, Kennedy said the NFPA has a formal process for revisions to keep standards up to date.

Pauls is one of four experts who joined a group of transportation advocates that challenged the safety of two proposed deep stations, asking federal Homeland Security officials to halt construction of NJ Transit's station and one being built by the Long Island Railroad to bring its trains to Grand Central Terminal. They've asked for independent experts to be brought in and for consideration of alternatives that are closer to the surface, such as routing trains to the existing Penn Station.

Standards outdated

Current fire and safety standards haven't kept up with the new generation of deep stations, said Glenn Corbett, associate professor of fire science at John Jay College. Corbett and Paul are two of four experts consulted on issues raised in a letter sent to U.S. Homeland Security and other agencies by the Institute for Rational Urban Mobility.

"Placing large numbers of people underground isn't one area where we've done all the research," Corbett said. "Our model building codes don't adequately address that issue and treat the subterranean issue like an inverted high-rise (building) and say the same things apply."

The average subway is 20 to 30 feet under the ground, said Corbett, who has raised similar concerns about the underground sections of the proposed 9/11 museum being built at the World Trade Center site.

Institute President George Haikalis said in his letter to Homeland Security that both stations are deep, multi-track terminals that will handle heavier passenger traffic than a deep "way" station where only a fraction of passengers on a train may get on or off.

"These deep cavern terminal railway stations with their heavy loads are unprecedented in the U.S. and no comparable examples exist globally," Haikalis said.

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Project leaders said they've anticipated those factors by meeting with first responders on both sides of the Hudson River before designing the station and complying with 12 pages of federal, state, New York City and industry safety codes and guidelines. They've incorporated standards only under consideration and assembled a design team that has built deep stations in Atlanta, Seattle and Washington, and rail tunnels in Singapore and Albania.

Silber said the designers haven't sought a waiver from a single design standard.

Backups in place

"If one (safety item) is required, we've put in two. If two are required, we've put in three," Silber said of the underground station, which will stretch almost 2 1/2 city blocks from Herald Square to Eighth Avenue.

The station will have backups to the backup systems. Live electric lines connecting the station through the tunnel to New Jersey's electrical grid will provide backup power in case of an outage in New York, Silber said. An on-site diesel generator can provide power for essential electrical systems for 24 hours without refueling, he said. Extra ventilation fans and escalators also are in the designs.

"Every request made of us, by the police, fire department and Homeland Security, we've accommodated," Silber said.

Designers also had Homeland Security officials and terrorism experts do a threat assessment and those recommendations, which he declined to disclose for security reasons, have been included, Silber said.

Corbett said getting first responders involved upfront is an important step — better than relying on research assumptions.

"First responders have to be involved. (Research) people make wild assumptions of what firefighters will do," Corbett said. "At the heart of the issue is what assumptions are being made and who is making them. It's an important issue and this is a fairly new thing about excessively deep terminals."

Kennedy said, through Wycoff, that neither Pauls nor Corbett has proposed changes to NFPA standard 130.

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