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**Responses Begin to Federal World Trade Center Report
Recommendations**

June 24, 2005

Industry groups are joining forces to review recommendations for changes to structural and life-safety systems for tall buildings proposed by the National Institute of Standards and Technology as part of its \$16-million World Trade Center Investigation. The recommendations, released June 23 for public comment, will form the basis of a debate on how future tall buildings will be designed and constructed and how building codes may evolve.

The National Council of Structural Engineers Associations, the American Institute of Architects and the Council on Tall Buildings and Urban Habitat are forming a joint panel to review the draft report and provide an "official" opinion on the part of the profession. In addition, the Association of Major City/County Building Officials has announced it will review the draft and provide NIST with formal comments from the nation's largest cities and counties.

Claude Cooper, AMCBO chairman and Richmond, Va., building official, said in a statement: AMCBO members are "gratified that this report reinforces the fact that tall buildings involved in the disaster were built safely and, for the most part, performed as they were designed.

"AMCBO is pleased NIST has offered...thoughtful recommendations from their research for us to consider regarding the design, construction and operation of tall and iconic buildings," he said. "Our comments will include possible coordination of major city/county support for suggested code changes found in that report."

In addition to Richmond, some AMCBO members are New York, Chicago, Los Angeles, Detroit, Milwaukee, Denver, St. Louis and Philadelphia.

In the design arena, NIST is calling for changes to building standards, codes and practices, especially for structural and life safety system design and emergency evacuation of buildings. Specific recommendations concern stairs, elevators, fireproofing of structural steel, and structural integrity to reduce chances of progressive collapse in high-rise buildings during disaster situations.

Of particular concern at the World Trade Center was that 6% of the people who evacuated the two towers—representing about 1,000 individuals—were physically challenged. "It appears that building commissioners need to consider ways to better accommodate the needs of these people," Cooper said.

Stephen S. Szoke, director of codes and standards for the Portland Cement Association, Skokie, Ill., says that many of NIST's proposals have already been discussed by professional organizations and other bodies but has been rejected, often because available "data" did not indicate a need for a change. He does not expect the NIST recommendations to further the push for changes in model codes.

"Most of the recommendations that relate to technical provisions of building codes have been discussed in the model code development arenas for the past several decades, including during the development and subsequent changes to the first edition of the International Code Council's International Building Code and National Fire Protection Association Building Construction and Safety Code, NFPA 5000,"

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says Szoke "The Portland Cement Association and its allies in the cement-based product industries have initiated many of these discussions via code change proposals. Such proposals have attempted to strengthen code provisions by increasing the required fire resistance rating of the structural frame, eliminating sprinkler trade-offs and improving compartmentation by increasing the required fire resistance rating and/or requiring fire resistance rated barriers where codes presently do not require rated walls. Specific emphasis on required fire resistance rating has been related to exit stairway walls, by modifying the hose stream test of American Society for Testing and Materials E 119 Standard Test Methods for Fire Tests of Building Construction and, Materials to require a more rigorous test.

" Almost all of these proposals have been disapproved," he says. "The reason generally cited for their disapproval is that fire data does not indicate a need for the change. While PCA and our allied industry groups support many of NIST's recommendations, based on our experience over the past several decades, we do not anticipate any significant changes will be made in our model codes as a result of the NIST study."

NIST's recommendations are a result of studying only the behavior of occupants, emergency responders and the twin 110-story towers after the terrorist attacks on Sept. 11, 2001. But it is basing its recommendations on its findings related to procedures and practices commonly used for buildings under normal conditions, said S. Shyam Sunder, a NIST deputy director and the lead investigator in the three-year WTC study. Sunder's remarks were made during a media briefing June 23, in New York City.

Sunder said NIST did not study any other commercial buildings or any other emergency scenarios in forming its recommendations. He did, however, say the "tragic consequences" of the Sept. 11 attacks were "directly attributable to the fact that terrorists flew large, jet-fuel-laden commercial airliners into the WTC towers." He also said that "buildings for use by the general population are not designed to withstand aircraft attacks" and that "building codes do not require building designs to consider aircraft impact."

In earlier briefings, Sunder made it clear that the twin towers performed well on 9/11 and that the fact that they did not collapse on impact of the jetliners is a tribute to their structural redundancy, which saved thousands of lives.

Still, he said "public officials and building owners will need to determine appropriate performance requirements for buildings that are at higher risk due to their iconic status, critical function or design."

The public comment period will end at the end of the business on Aug. 4, Eastern Daylight Time.. NIST is holding a conference to discuss putting its recommendations into practice on Sept. 13-15, in Gaithersburg, Md. The final WTC report will be issued in September.

The NIST report on Seven WTC, which collapsed on 9/11 after burning unattended for about five hours, will be released in draft form in October and final form in December.

Sunder said NIST believes its recommendations are realistic and achievable within "a reasonable period" of time and that implementation of the recommendations would make buildings, occupants and emergency responders safer in future emergencies.

The recommendations do not prescribe specific threshold levels. Sunder says this is not the responsibility of NIST.

The recommendations that relate to "increased" structural integrity are that progressive collapse should be prevented in buildings through development and nationwide adoption of consensus standards and code provisions, with tools and guidelines needed for their use in practice. NIST recommends developing a standard methodology to reliably predict the potential for complex failures in structural systems subjected to multiple hazards.

NIST also urges that nationally accepted performance standards be developed for conducting wind tunnel testing of prototype structures. According to the Structural Engineering Institute, such a standard is well into development and will be released for public comment by the end of the year.

SEI representatives were present at the briefing. "Our position is that such a humbling event as 9/11 requires the institution and the profession to look at the loads

and conditions we do consider [in design] and ask whether we need to broaden the spectrum of those events and conditions to fulfill our responsibility of providing safe buildings to the public," said Jeremy Isenberg, SEI president and president-CEO of Weidlinger Associates Inc.

When asked to define "safe," Jim Harris, SEI board member and head of J.R. Harris & Co., Denver, said, "Safety is not absolute, it is relative and we are examining conditions of how safe is safe enough."

Harris said he finds the study beneficial because it gives the profession more information on how buildings perform in fires not necessarily initiated by a terrorist event. "We think NIST has given us a lot to consider," he said, adding that he thinks NIST "should not have delayed" bringing the findings to the public."

Initially, the report was supposed to be done in two years. NIST had developed its recommendations by the end of last year. Harris also thinks more study will be necessary, and not just by NIST. "Though NIST should not have studied other buildings before releasing this report," he said, other buildings should be studied.

While the investigation into the collapse appears to be "top-notch, nowhere in the sections of the report which I reviewed does NIST define the 'fire problem' which the nation actually faces," says Richard C. Schulte, a fire protection consultant based in Evanston, Ill.

The National Fire Protection Association (NFPA) released a study of high-rise building fires in September 2001. "This study indicates that in the 14-year period between 1985 and 1998 there were a total of 7 fire fatalities in all of the high-rise office buildings throughout the United States," says Schulte.

Statistics collected by NFPA consistently show that more than 60% of the fire fatalities that occur in the U.S. occur in 1- and 2-family dwellings and that 80% of the fire fatalities occur in residential occupancies (homes and apartment buildings), he adds.

NFPA fire statistics also indicate that in a typical year roughly 200 Americans die in fires in commercial (non-residential) buildings, says Schulte. In recent years, the number of fatalities has dwindled to fewer than 100 people.

In May, NFPA released data from a study on fire department personnel fatalities and injuries. Last year, roughly 100 firefighters died in the line of duty. In previous years, two-thirds of the number of firefighter fatalities were volunteer and forestry firefighters. Only between 30 and 40 municipal firefighters die each year in the line of duty. According to NFPA, the principal reason for firefighter fatalities are heart disease, with transportation accidents the second leading cause of firefighter fatalities. The number of firefighters who die due to fire or building collapse is just a handful, Schulte adds.

"NFPA fire statistics show that our nation has never been more fire safe (and firefighters have never been safer), yet the NIST report is written as if fire safety is a major problem in the United States," says Schulte. "As a fire protection engineer with 29 years of experience in the field, I strongly disagree with this conclusion. Since the early 1970's, there has been much progress in the fire safety field. I would hope that the Congressional Science Committee would begin asking NIST for its basis for proposing such radical changes in the fire safety field, particularly in light of the excellent fire safety record of commercial building and, in particular high rise buildings."

NIST urges that performance standards also be developed to estimate wind loads and their effects on tall buildings for use in design, based on wind tunnel testing data and directional wind speed data.

Harris believes some of the recommendations should be applied to existing buildings, especially relating to redundancy in fire suppression systems. Also, importance thresholds for progressive collapse resistance may be different for new and existing buildings, he said. Harris said he does not believe the current stock of buildings is dangerous. He added that NIST did not reveal, in most cases, how it determined their "high-priority needs" that formed the basis of the recommendations.

Under structural integrity, NIST recommends developing and implementing "appropriate" criteria to enhance the performance of tall buildings by limiting how much they sway under lateral load design conditions. "Limiting building sway is a way

of ensuring stability," said Sunder.

ACI 318 "Building Code Requirements for Structural Concrete" has had structural integrity requirements since the 1989 version of the code, says David N. Bilow, director, engineered structures at the Portland Cement Association, Skokie, Ill. "ASCE 7 "Minimum Design Loads for Buildings and Other Structures" has included structural integrity requirements for many years and has recently improved the requirements.

According to Bilow, IBC has not adopted the section of ASCE 7 on structural integrity. Therefore, IBC has no provisions for structural integrity for steel, wood and masonry (unless these material design standards have something on it). But there are provisions for concrete because ACI Committee 318 has unilaterally imposed it on the concrete industry.

"As NIST does not have prescriptive nor threshold recommendations, it will be up to the code bodies to develop new requirements for structural integrity, if needed," Bilow says.

Experts wonder whether NIST found any tall buildings that are unstable and how NIST concluded that tall buildings' performance "needs" to be improved. "NIST's recommendations have improved on some of their logic from what they published in their findings a few months ago," says Jon D. Magnusson, chairman-CEO of structural-civil engineer Magnusson Klemencic Associates, Seattle Magnusson is a member of the National Fire Protection Association's high-rise building safety advisory committee, which will be meeting with NIST July 12-13 to review the draft report. Magnusson was also a member of the American Society of Civil Engineers-Federal Emergency Management Agency's building performance assessment team that issued the first report on the WTC disaster, in mid-2002.

Magnusson says he agrees with 16 of NIST's 30 recommendations. "The common problem with the other 14 is that there is absolutely no historical data that demonstrates that the changes will actually increase public safety and first responder safety," says Magnusson. "This quite simply makes for an ineffective set of changes. Even worse, for many of these, I can show you how the recommendations could actually reduce safety. As we all work for improvements in public safety, it is critically important that we do not divert the resources of our society from effective strategies to ineffective ones."

NIST is urging the building and fire safety communities to give "immediate and serious consideration" to these recommendations to achieve "appropriate" improvements in the way buildings are "designed, constructed and maintained and used and in evacuation and emergency response procedures."

After issuance of the final report, NIST, as required by the National Construction Safety Team Act, must "conduct or enable or encourage the conduct of appropriate research recommended by the NCST and promote appropriate adoption of the recommendations by the federal government and other agencies and organizations.

The full report is available on wtc.nist.gov.

Nadine M. Post, Engineering News Record

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