

First Comprehensive Set of Model Code Changes Adopted Based on Recommendations from Commerce's NIST World Trade Center Investigation

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CONTACT: Michael E. Newman
(301) 975-3025
michael.newman@nist.gov

GAITHERSBURG, Md.-Safer buildings-especially tall structures-that are more resistant to fire and more easily evacuated in emergencies are the goal of the first comprehensive set of building code changes recently approved by the International Code Council (ICC) based on recommendations from the Commerce Department's National Institute of Standards and Technology (NIST). The recommendations were based on the findings of NIST's three-year investigation of the collapses of New York City's World Trade Center (WTC) towers on Sept. 11, 2001. The changes will be incorporated into the 2007 supplement to the ICC's International Building Code (IBC), a model code used as the basis for building regulations promulgated and enforced by U.S. state and local jurisdictions. Those jurisdictions have the option of incorporating some or all of the code's provisions but generally adopt most provisions.

"We fully endorse these code changes and are gratified that NIST's WTC recommendations have stimulated fundamental and substantial changes in U.S. building codes and standards that represent a significant improvement in public safety over current practice," says Shyam Sunder, lead WTC investigator for NIST. "NIST is committed to continuing our work to support industry and the nation's building and fire safety officials so that the remaining recommendations are also fully considered."

All but one of the proposed changes (one change was approved earlier) to the IBC based on the NIST WTC investigation recommendations were submitted in March 2006 by the ICC's Ad Hoc Committee on Terrorism Resistant Buildings, its Code Technology Committee and the U.S. General Services Administration. The proposals were developed and refined on the basis of feedback provided by building code experts convened by the National Institute of Building Sciences (NIBS) with support from NIST.

The proposals addressed areas such as increased resistance to building collapse from fire and other incidents, use of sprayed fire-resistive materials (commonly known as "fireproofing"), performance and redundancy of fire protection systems (i.e., automatic sprinklers), fuel oil storage/piping, elevators for use by first responders and evacuating occupants, the number and location of stairwells, and exit path markings.

The model code changes consistent with the NIST WTC investigation recommendations that are now required by the IBC-including those approved at the ICC final

action hearings in Rochester, N.Y., during May 21-26, 2007-are:

- An additional exit stairway for buildings more than 420 feet in height.
- A minimum of one fire service access elevator for buildings more than 120 feet in height.
- Increased bond strength for fireproofing (nearly three times greater than currently required for buildings 75-420 feet in height and seven times greater for buildings more than 420 feet in height).
- Field installation requirements for fireproofing to ensure that:
 - installation complies with the manufacturer's instructions;
 - the substrates (surfaces being fireproofed) are clean and free of any condition that prevents adhesion;
 - testing is conducted to demonstrate that required adhesion is maintained for primed, painted or encapsulated steel surfaces; and
 - the finished condition of the installed fireproofing, upon complete drying or curing, does not exhibit cracks, voids, spalls, delamination or any exposure of the substrate.
- Special field inspections of fireproofing to ensure that its as-installed thickness, density and bond strength meet specified requirements, and that a bonding agent is applied when the bond strength is less than required due to the effect of a primed, painted or encapsulated steel surface. The inspections are to be performed after the rough installation of mechanical, electrical, plumbing, sprinkler and ceiling systems.
- Increasing by one hour the fire-resistance rating of structural components and assemblies in buildings 420 feet and higher. (This change was approved in a prior edition of the code.)
- Explicit adoption of the "structural frame" approach to fire resistance ratings that requires all members of the primary structural frame to have the higher fire resistance rating commonly required for columns. The primary structural frame includes the columns, other structural members including the girders, beams, trusses, and spandrels having direct connections to the columns, and bracing members designed to carry gravity loads.
- Luminous markings delineating the exit path (including vertical exit enclosures and passageways) in buildings more than 75 feet in height to facilitate rapid egress and full building evacuation.

Two more model code changes will be considered for the next edition of the IBC in 2009.

"In the first case, a broad industry coalition has made excellent progress toward developing a proposal to be submitted by the August 2007 deadline for the next code revision cycle," according to Sunder.

If adopted, the new model code provision would recommend that structures be designed to mitigate disproportionate progressive collapse and ensure, for the first time, minimum structural integrity and robustness requirements for structures as complete systems.

The second proposed code change would require the use of a nationally accepted standard for conducting wind tunnel tests routinely used for determining wind loads in the design of tall buildings. During its investigation of the collapses of the WTC towers, NIST found that wind load estimates from three separate wind tunnel tests on WTC models differed greatly. This code change proposal is awaiting final adoption of a standard for conducting wind tunnel tests by the American Society of Civil Engineers (ASCE). A nationally accepted standard for estimating wind loads and their effects on tall buildings based on wind tunnel testing and directional wind speed

data-a NIST recommendation above and beyond the standard for conducting such tests-remains to be developed.

Four model code change proposals that were not accepted into the IBC this time are being revised using feedback from ICC members at the May final action hearing. The revised proposals are expected to be resubmitted this August for adoption in the next code revision cycle for the IBC in 2009. These proposals require:

- Significantly limiting the length of horizontal transfer corridors in stairways and requiring signage when such corridors change direction.
- Enhancing situational awareness of firefighters and other emergency responders by requiring:
 - video monitoring of stairways, elevators, elevator lobbies, and elevator machine rooms and machinery spaces; and
 - additional features for emergency command centers, including controls and status indicators for remote control valves on vertical sprinkler/standpipe risers.
- Increasing the physical separation distance (remoteness) between exit stairway enclosures beyond that currently required to protect the egress system from accidental structural loads in addition to fires.
- Enhancing the functional integrity and survivability of exit stairway wall enclosures for buildings greater than 420 feet in height by requiring wall surfaces to possess a minimum level of structural robustness through an ability to withstand a sudden increase in pressure.

For more information, including a Web-based system for tracking the progress toward implementing all of the NIST WTC recommendations, go to <http://wtc.nist.gov>.

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Contact: inquiries@nist.gov