From: Benjamin Stein <bstein@nist.gov>
To: "wtc@nist.gov" <wtc@nist.gov ...snip...
Cauffman <cauffman@nist.gov>
Subject: FW: 3: NIST WTC 7 Investigation Finds Building Fires Caused Collapse

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From: Dan Baron <danbaron@dialup4less.com>
To: NIST-stein <ben.stein@nist.gov>, NIST-newman <mnewman@nist.gov>,
counterpunch <counterpunch@counterpunch.org>, garcia <mango@idiom.com>,
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Date: Mon, 25 Aug 2008 14:15:53 -0400
Subject: 3: NIST WTC 7 Investigation Finds Building Fires Caused Collapse
Thread-Topic: 3: NIST WTC 7 Investigation Finds Building Fires Caused
Collapse
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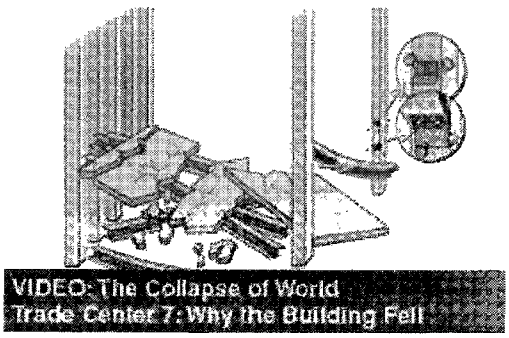
2008-08-25

Sorry for me continuing to beat on this, but I noticed one more thing about the NIST article.

"The heat from these uncontrolled fires caused thermal expansion of the steel beams on the lower floors of the east side of WTC 7, damaging the floor framing on multiple floors. Eventually, a girder on Floor 13 lost its connection to a critical interior column that provided support for the long floor spans on the east side of the building. The displaced girder and other local fire-induced damage caused Floor 13 to collapse, beginning a cascade of floor failures down to the fifth floor."

"The buckling resulted from fire-induced damage to floors around Column 79, failure of the girder between Columns 44 and 79, and cascading floor failures."

From the above quotes, Sunder is saying that on Floor 13, the floorbeam (girder) between Columns 44 and 79 expanded (became longer) and *"lost its connection"* to Column 79. I'll put two diagrams below from the article, so I can show what I want to show you.



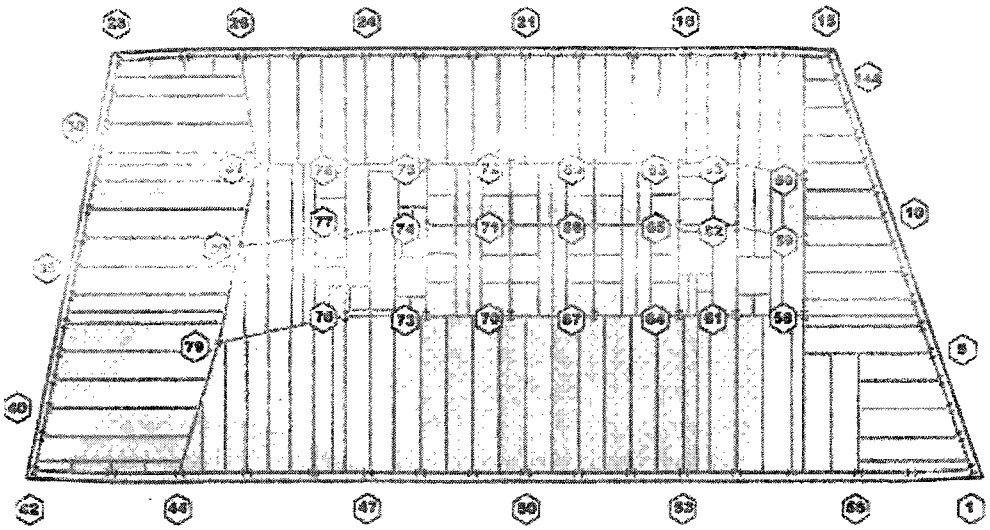


Diagram 0

Diagram 1

(In Diagram 1, the direction north is towards the right of the page, i.e., Column 28 is at the southwest corner, and Column 1 is at the northeast corner.)

To make things simple, let's call the floorbeam on Floor 13 extending between columns 44 and 79, 'Floorbeam A'.

Diagram 0 shows that Floorbeam A was constrained from below and above by two clip angles. A clip angle is a rectangular flat steel plate which is bent parallel to two of its opposite edges, into a 90 degree angle. At the end connection in question, the vertical 'legs' of each of the two clip angles were attached to Column 79, and the horizontal legs were attached to the bottom and top of Floorbeam A. You can see that the 'bend lines' of these two clip angles were oriented horizontally.

Diagram 0 shows that the heat expansion of Floorbeam A sheared (like cutting with a scissors) the bolts which fastened it to the two clip angles' horizontal legs. I agree that under certain circumstances, that could happen. In that case, as Floorbeam A expanded, there would had to have been relative movement between it and the clip angles' horizontal legs, and the bolts would be sheared. In order for this to have occurred, Column 79 had to provide resistance to Floorbeam A's expansion. In Diagram 1, this would mean that Column 79 in effect, pushed against the west end of Floorbeam A, i.e., Column 79 pushed east. But interestingly, Sunder is implying that sometime after that, Column 79 began 'pulling' in the opposite direction, west, allowing Floorbeam A to fall out of its connection with Column 79 (to slide out from between the two horizontal clip angle legs), and Floor 13

then to at least partially collapse, as shown in Diagram 0. I assume that Sunder is implying that once Floorbeam A was gone, that Column 79 buckled in the direction of where Floorbeam A had been, bowing east. I'm not saying that this sequence of events is impossible, but it sure seems unlikely to me that the two changes in directions of Column 79's horizontal forces, would be instantaneous.

(If you instead think that the bolts connecting Floorbeam A to Column 79 failed because Floorbeam A 'sagged' due to heat, then I think you are wrong. Visible vertical deflection at the center of a structural steel beam (sagging) occurs at very high temperatures; not at temperatures, □*hundreds of degrees below those typically considered in current practice for fire resistance ratings.*".)

In summary, I think the article in no way makes an 'open and shut case', and is actually about as clear as mud. Maybe both volumes together of the report are clearer, and make a better case. Maybe, someone will read them in their entirety.

2008-08-23
[
Here are some additional things I thought of, concerning this NIST report.

(Everything I put yesterday, and am putting today, came from my head alone. I haven't read any commentaries or heard any analysis. Last night, I heard on the radio that the initial report had been released, and I Googled the article shown below, and then read it. I'm not implying this makes my comments special, I'm just saying they are my own. If others come to similar conclusions, then you can judge for yourself what that might indicate.)

Comments:

This is one report that people who are knowledgeable in science and engineering, should *"pound into the pavement"*.

"the fires burned out of control on six lower floors. The heat from these uncontrolled fires caused thermal expansion of the steel beams on the lower floors of the east side of WTC 7, damaging the floor framing on multiple floors." Any proof of this, or is it only an assertion?

"Eventually, a girder on Floor 13 lost its connection to a critical interior column that provided support for the long floor spans on the east side of the building. The displaced girder and other local fire-

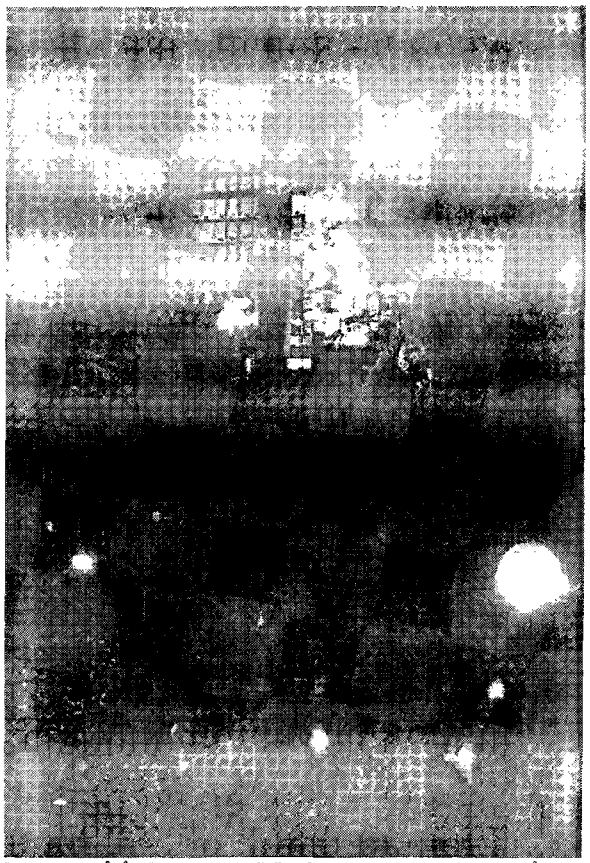
induced damage caused Floor 13 to collapse, beginning a cascade of floor failures down to the fifth floor. Many of these floors had already been at least partially weakened by the fires in the vicinity of the critical column. This collapse of floors left the critical column unsupported over nine stories." The assertion that *"many of these floors had already been at least partially weakened by the fires in the vicinity of the critical column"* is just NIST's opinion, as far as I can determine. In fact, the entire quotation seems to be only assertions without evidence. Anyone can construct a narrative, right?

Where did the oxygen come from for these *"out of control"* fires? As far as I am aware, most of the windows in WTC7 retained their glass until the collapse. Also, where was all of the smoke?

As far as I know, NIST made this report without any physical evidence. I think all of the structural steel from WTC7 was long gone by the time the investigation began. And yet, NIST claims to have determined the particular connection, out of thousands, which initiated the collapse. To me, this is analogous to a 757 crashing and sinking in the deepest part of the ocean, and then the NTSB saying it did a computer simulation, and knows for sure, the particular part which failed and caused the jet to fall out of the sky.

Concerning *"the most complex computer simulations ever conducted"*. Obviously, the answers which were output, depended upon the initial conditions which were input. Those initial conditions would consist of a set of events comprising causation, {A,B,C,...}. The entire set of input must be correct for the output to be correct. NIST does not enumerate what those initial conditions were. If it had, it could have assigned an estimated probability to each supposed individual causal event. The probability of the entire set occurring, could then have been calculated as the product of the individual probabilities. I bet that any honest calculation of the set probability, would have been much less than 0.1.

Big fires have burned more intensely and for longer times in other steel skyscrapers previously, and none collapsed. For instance, in 2005, the Windsor Building, in Madrid, underwent a real inferno, as shown below. It burned for 24 hours, and still stood. What was unique about WTC7, which caused it to be the one steel skyscraper in history to collapse from a fire? (Of course, if you also count WTC1 and WTC2, then there have been three steel skyscrapers in history which have collapsed from fires. And amazingly, all on the same day! What do you think the odds of that are?!)



http://whatreallyhappened.com/WRHARTICLES/spain_fire_2005.html
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2008-08-22
[
Just a few comments about this from me. It seems useless to me to waste much time on this. Some people are ignorant; some are dumb; some don't care about the truth; some believe only what they want to believe, in every circumstance; some lie, for what they believe is their own benefit. Do you think that taking time to dispute official government *"scientific"* reports about the causes of 9/11, could indicate masochistic tendencies?

Anyway, apparently, NIST discovered a new way that steel skyscrapers can collapse. Fortunately, it also warns structural engineers about what they should be wary of in the future. Don't you think it must have been a miracle that this is the first time this failure mode manifested in the world's over 100 year history of steel skyscrapers?!

□*while the partial or total collapse of a tall building due to fires*

is a rare event". I agree, the only one ever, of thousands, qualifies as *"rare"*.

The NIST report must be correct, because it gives such a detailed account of how the building failed, right? And NIST used computer simulations, *"the most complex computer simulations ever conducted to model a building□s response behavior and determine its collapse response due to a combination of debris impact damage, fires and a progression of structural failures from local fire-induced damage to collapse initiation, and, ultimately, to global collapse"*, so who can dispute the findings? On the other hand, there is the old acronym from computer science, GIGO, *"garbage in, garbage out"*. But then again, you have to marvel at the amazing accuracy of computer simulations that, for instance, can predict the directions of hurricanes - even an hour into the future!

NIST is saying that a long steel floor beam expanded from fire heat, and broke its end connection, to column 79. The first problem I think of with that, is that the expansion would push the end of the beam against the column, making it difficult for it to detach from the clip angle it was resting on. More likely, the expansion would only cause column 79 to bow. NIST shows a picture of the detachment, but says nothing else. Secondly, NIST says this happened at temperatures *□hundreds of degrees below those typically considered in current practice for fire resistance ratings."*. The problem with that is, that skyscrapers have always been designed for the forces due to steel expansion from the thermal loads of the exact temperatures of current practice for fire resistance ratings. The possibility of fires in skyscrapers is not something that structural engineers never thought of. And you know, the last thing a structural engineer wants to happen, is to have a structure he designed fail. The smallest possibility will keep him awake at night.

Don't just the intricacy and certitude of NIST's findings, raise your mind's *"con"* flag?

□hundreds of degrees below those typically considered in current practice for fire resistance ratings." To me, this indicates that there was no way that NIST could make a case for the fire being hot enough to substantially soften the steel, so instead it played the only other card it thought it had, what I would call, *"the tall tale"*. Didn't Hitler say something about the willingness of people to believe really big lies? I think this is NIST whistling past the graveyard, the king walking down the street naked.

How about this problem? NIST doesn't say anything about what exactly it was that was burning. It says, it wasn't fuel oil. Then, what was it? Office furniture? How hot were the flames? It is impossible for a

fire to heat an object to a temperature higher than that of itself, right? --> Heat flows from higher temperature to lower.

"NIST found that the impact of debris from the collapse of WTC 1 ignited fires on at least 10 floors of WTC 7, and the fires burned out of control on six lower floors." Does that make sense to you? WTC1 was 355 feet from WTC7. http://911research.wtc7.net/wtc/analysis/wtc7/index.html And anyway, how could debris falling on WTC7, ignite fires on 10 of its floors? Because NIST proclaims it could?

Do NIST's precise recommendations for preventing another occurrence of such a catastrophe, remind you of the murderer who provides the police with so many tantalizing leads for finding the killer?

"The team said that the smallest blast event capable of crippling the critical column would have produced a 'sound level of 130 to 140 decibels at a distance of half a mile,'. I won't argue with that. But how about this? How many decibels do thermite and thermate produce?

The lead NIST investigator, Shyam Sunder, has a Ph.D. in structural engineering from M.I.T. But does that prove he is honest? It could be that someone told him *"how"* WTC7 fell, and it was his job to sell it, right? A guy could be the smartest human in history, but if he is bullshitting, then it's pretty easy to make him look like a monkey, if you get the chance to publicly question him. The difficulty is, getting the chance.

And Sunder's boss is the federal government, right? Could that be like the wolf hiring the dog, to determine who killed the sheep?

Never forget these timeless words of wisdom, *"If you can't convince 'em, confuse 'em!"*.

Dan Baron
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M.S. Civil Engineering, University of Illinois at Chicago
Ph.D. Engineering Mechanics, University of Illinois at Chicago
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http://www.nist.gov/public_affairs/releases/wtc082108.html

NIST WTC 7 Investigation Finds Building Fires Caused Collapse

Report and Recommendations for Improving Building Safety Released for Comment

August 21, 2008

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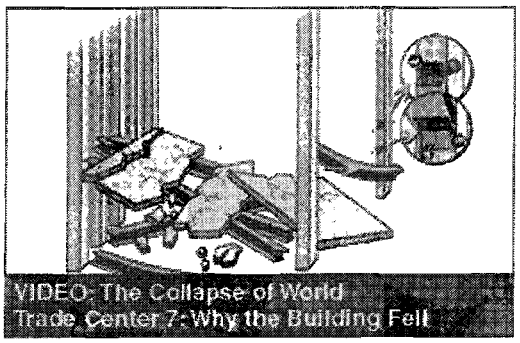
Related Documents

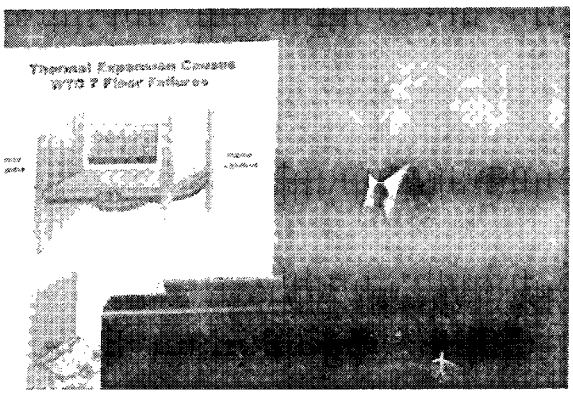

VIDEO: The Collapse of World Trade Center 7-Why the Building Fell

GAITHERSBURG, Md.□The fall of the 47-story World Trade Center building 7 (WTC 7) in New York City late in the afternoon of Sept. 11, 2001, was primarily due to fires, the Commerce Department□s National Institute of Standards and Technology (NIST) announced today following an extensive, three-year scientific and technical building and fire safety investigation. This was the first known instance of fire causing the total collapse of a tall building, the agency stated as it released for public comment its WTC investigation report and 13 recommendations for improving building and fire safety.

□*Our study found that the fires in WTC 7, which were uncontrolled but otherwise similar to fires experienced in other tall buildings, caused an extraordinary event,*□ said NIST WTC Lead Investigator Shyam Sunder. □*Heating of floor beams and girders caused a critical support column to fail, initiating a fire-induced progressive collapse that brought the building down.*□

□*Video and photographic evidence combined with detailed computer simulations show that neither explosives nor fuel oil fires played a role in the collapse*

of WTC 7, Sunder said. The NIST investigation team also determined that other elements of the building's construction—namely trusses, girders and cantilever overhangs that were used to transfer loads from the building superstructure to the columns of the electric substation (over which WTC 7 was constructed) and foundation below—did not play a significant role in the collapse.



Shyam Sunder, NIST lead investigator, answers questions at a news briefing on August 21 about NIST's three-year study of the collapse of World Trade Center 7.

Photo by Don Berkemeyer
View hi-resolution image

According to the report, a key factor leading to the eventual collapse of WTC 7 was thermal expansion of long-span floor systems at temperatures *hundreds of degrees below those typically considered in current practice for fire resistance ratings."* WTC 7 used a structural system design in widespread use.

Citing its one new recommendation (the other 12 are reiterated from the previously completed investigation of the World Trade Center towers, WTC 1 and 2), the NIST investigation team said that *while the partial or total collapse of a tall building due to fires is a rare event, we strongly urge building owners, operators and designers to evaluate buildings to ensure the adequate fire performance of the structural system. Of particular concern are the effects of thermal expansion in buildings with one or more of the following features: long-span floor systems, connections not designed for thermal effects, asymmetric floor framing and/or composite floor systems.* Engineers, the team said, should be able to design cost-effective fixes to address any areas of concern identified by such evaluations.

The investigators also reported that if the city water

main had not been cut by the collapse of World Trade Center towers 1 and 2 (WTC 1 and WTC 2), operating sprinklers in WTC 7 would likely have prevented its collapse. Nevertheless, Sunder said, we recommend *that building standards and codes be strengthened beyond their current intent to achieve life safety by preventing structural collapse even during severe fires like this one, when sprinklers do not function, do not exist or are overwhelmed by fire.*

Sunder identified several existing, emerging or even anticipated capabilities that could have helped prevent WTC 7s collapse. He cautioned that the degree to which these capabilities improve performance remains to be evaluated. Possible options for developing cost-effective fixes include:

- More robust connections and framing systems to better resist effects of thermal expansion on the structural system.
- Structural systems expressly designed to prevent progressive collapse, which is the spread of local damage from a single initiating event, from element to element, eventually resulting in the collapse of an entire structure or a disproportionately large part of it. Current model building codes do not require that buildings be designed to resist progressive collapse.
- Better thermal insulation (i.e., reduced conductivity and/or increased thickness) to limit heating of structural steel and to minimize both thermal expansion and weakening effects. Insulation has been used to protect steel strength, but it could be used to maintain a lower temperature in the steel framing to limit thermal expansion.
- Improved compartmentation in tenant areas to limit the spread of fires.
- Thermally resistant window assemblies to limit breakage, reduce air supply and retard fire growth.

The 12 recommendations reiterated from the WTC towers investigation address several areas, including specific improvements to building standards, codes and

practices; changes to, or the establishment of, evacuation and emergency response procedures; and research and other appropriate actions needed to help prevent future building failures.

Determining the probable collapse sequence for WTC 7, NIST found that the impact of debris from the collapse of WTC 1 ignited fires on at least 10 floors of WTC 7, and the fires burned out of control on six lower floors. The heat from these uncontrolled fires caused thermal expansion of the steel beams on the lower floors of the east side of WTC 7, damaging the floor framing on multiple floors. Eventually, a girder on Floor 13 lost its connection to a critical interior column that provided support for the long floor spans on the east side of the building. The displaced girder and other local fire-induced damage caused Floor 13 to collapse, beginning a cascade of floor failures down to the fifth floor. Many of these floors had already been at least partially weakened by the fires in the vicinity of the critical column. This collapse of floors left the critical column unsupported over nine stories.

When this critical column buckled due to lack of floor supports, it was the first domino in the chain, Sunder explained. *What followed in rapid succession was a progression of structural failures. Failure first occurred all the way to the roof line involving all three interior columns on the most eastern side of the building. Then, progressing from east to west across WTC 7, all of the columns in the core of the building failed. Finally, the entire fagade collapsed.*

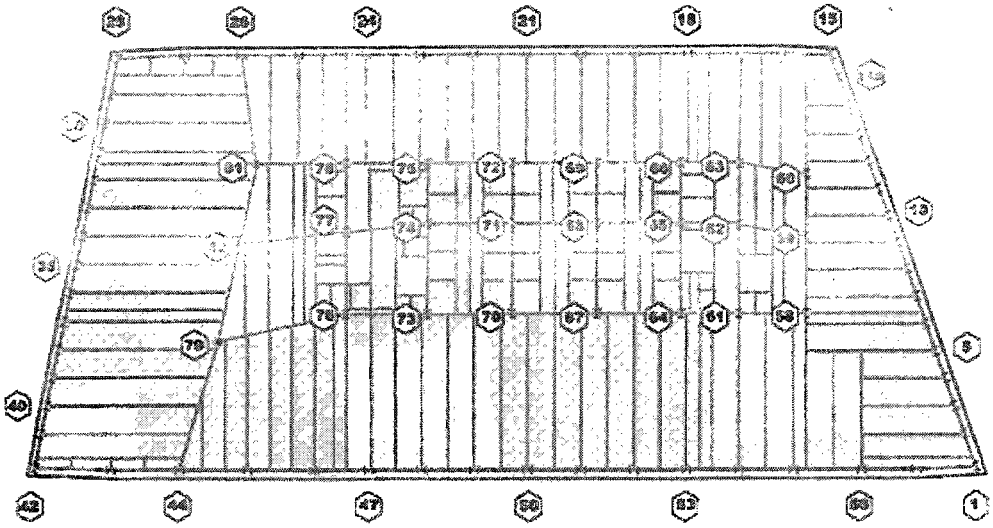


Diagram 1□Typical WTC 7 floor showing locations of columns (numbered). The buckling of Column 79 was the initiating event that led to the collapse of WTC 7. The buckling resulted from fire-induced damage to floors around Column 79, failure of the girder between Columns 44 and 79, and cascading floor failures. [Download high-res version]

The investigation team considered the possibility of other factors playing a role in the collapse of WTC 7, including the possible use of explosives, fires fed by the fuel supply tanks in and under the building, and damage from the falling debris of WTC 1.

The team said that the smallest blast event capable of crippling the critical column would have produced a □*sound level of 130 to 140 decibels at a distance of half a mile,*□ yet no noise this loud was reported by witnesses or recorded on videos.

As for fuel fires, the team found that they could not have been sustained long enough, could not have generated sufficient heat to fail a critical column, and/or would have produced □*large amounts of visible smoke*□ from Floors 5 and 6, which was not observed.

Finally, the report notes that □*while debris impact from the collapse of WTC 1 initiated fires in WTC 7,*

the resulting structural damage had little effect in causing the collapse of WTC 7.

The investigation team found that the design of WTC 7 was generally consistent with the New York City building code in effect at the time. The estimated 4,000 occupants of WTC 7 on the morning of Sept. 11 were evacuated without any fatalities or serious injuries.

To reach the conclusions in its report, NIST complemented its in-house expertise with private-sector technical experts; accumulated an extensive collection of documents, photographs and videos related to the WTC events of 9/11; conducted first-person interviews of WTC 7 occupants and emergency responders; analyzed the evacuation and emergency response operations in and around WTC 7; and performed the most complex computer simulations ever conducted to model a building's response behavior and determine its collapse sequence due to a combination of debris impact damage, fires and a progression of structural failures from local fire-induced damage to collapse initiation, and, ultimately, to global collapse.

NIST welcomes comments on the draft report and recommendations available online at http://wtc.nist.gov received by noon Eastern Daylight Time on Sept.15, 2008. Comments (instructions for submission are available at http://wtc.nist.gov) may be submitted via:

- e-mail to wtc@nist.gov;
- fax to (301) 869-6275; or
- surface mail to WTC Technical Information Repository, Attn: Stephen Cauffman, NIST, 100 Bureau Dr., Stop 8611, Gaithersburg, Md. 20899-8610.

The NIST investigation of WTC 7 was conducted under the National Construction Safety Team (NCST) Act, as part of its overall building and fire safety investigation of the World Trade Center disaster. The act gives NIST the responsibility for conducting fact-finding investigations of building failures that resulted in substantial loss of life or that posed significant potential of substantial loss of life. NIST has no

regulatory authority under the NCST Act.

As an agency of the U.S. Department of Commerce, NIST promotes U.S. innovation and industrial competitiveness by advancing measurement science, standards and technology in ways that enhance economic security and improve our quality of life.

Related Documents

- Questions and Answers about the NIST WTC 7 Investigation
- Opening Statement Press Briefing, August 21, 2008, Report on the Collapse of World Trade Center Building 7
- NIST Response to the World Trade Center Investigation Disaster Presentation, Dr. S. Shyam Sunder, Director and Lead Investigator, Building and Fire Research Laboratory, NIST
- NIST NCSTAR 1A, Final Report on the Collapse of World Trade Center Building 7
- NIST NCSTAR 1-9, Structural Fire Response and Probable Collapse Sequence of World Trade Center Building 7
  - Volume 1: Chapters 1 through 8
  - Volume 2: Chapters 9 through 14 and Appendixes A through E
- NIST NCSTAR 1-9A, Global Structural Analysis of the Response of World Trade Center Building 7 to Fires and Debris Impact Damage
- Video: The Collapse of World Trade Center 7: Why the Building Fell
- Process for Submitting Comments on the WTC 7 Draft Reports
- Download High-Res Graphics: Typical WTC 7 Floor Diagram (2 MB) and Thermal Expansion Illustration (29 MB)
- Link to WTC 7 Report Webcast, Thursday, Aug. 21, 11 a.m. EDT

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To stop future transmissions from me,
you can reply to this e-mail. In the subject
line, before "Re:", put *"stop"*, *"desist"*, or
"no more", etc. I should get the idea.
If you then still get stuff, it means I
missed your request. In that case, just do
it again. I probably won't miss it twice.
Anyway, my intention is not to send to you,
what you would prefer not to receive.

Best wishes, / Dan Baron.