UNITED STATES DEPARTMENT OF COMMERCE
National Institute of Standards and Technology
Gaithersburg, Maryland 20899-

June 24, 2010

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Mr. [redacted]

Dear Mr. [redacted]

Thank you for inquiring about the National Institute of Standards and Technology (NIST) investigation into the collapse of World Trade Center (WTC) Building 7 as detailed in your letter of April 26, 2010, to me, and your letter of May 31, 2010, to NIST Director Patrick Gallagher.

Your letters raise four main issues that will be addressed below.

Scientific inquiry

NFPA 921, "Guide for Fire and Explosion Investigations," is a recommended methodology for optimizing investigations. NFPA 921 acknowledges that each investigation is unique, and that some investigations will require broader procedures than it can accommodate. This was especially true for NIST's WTC investigation which responded to events that were much more than typical fires or explosions.

However, NIST's WTC 7 investigation did follow the core tenet of NFPA 921, which is *the application of the scientific method as the systematic investigation methodology*. The investigation was carefully planned, sources of information were identified and contacted, the building fire and collapse event and the investigation were documented, available evidence was obtained (including documents about the design and construction of the structure), and the origin of the fire was determined based on images, laboratory testing (conducted for the towers, but applicable to WTC 7), and mathematical analyses.

Additionally, in its study of WTC 7, NIST considered all available data and evaluated a range of possible collapse mechanisms: uncontrolled fires on the tenant floors, fuel oil fires, hypothetical blast events, and fires within the Consolidated Edison Substation. NIST developed a working hypothesis, modeled the fires and the building, and then used the models to test the hypothesis against the observed behavior of the building. This approach is fully consistent with the principles of scientific inquiry.

Temperature data and pyrotechnic materials

The Federal Emergency Management Agency (FEMA) Building Performance Assessment Team (BPAT) report of the WTC disaster was extensively reviewed by the NIST investigation team and served as a foundation for our study. Based on this knowledge, we disagree with your statement that "FEMA investigators concluded correctly in 2002 that a fire-induced collapse was unlikely" for WTC 7. In fact, the opposite was true. FEMA stated in its report that, "The performance of WTC 7 is of significant

interest because it appears the collapse was due primarily to fire, rather than any impact damage from the collapsing towers."[1] The FEMA report also documented the probable collapse sequence for WTC 7 and stated that, "During the course of the day, fires may have exposed various structural elements to high temperatures for a sufficient period of time to reduce their strength to the point of causing collapse."[2] Thus, the FEMA report clearly focused on a fire-induced collapse mechanism for WTC 7—a preliminary finding that the NIST investigation confirmed using the scientific method.

Additionally, there has not been any conclusive evidence presented to indicate that highly reactive pyrotechnic material was present in the debris of WTC 7. Studies that have been conducted to document trace metals, organic compounds and other materials in the dust and air from the vicinity of the WTC disaster have suggested common sources for these items. For example, in a published report from the U.S. Geological Survey (USGS) on an analysis of WTC dust, the authors state that "... the trace metal compositions of the dust and girder coatings likely reflect contributions of material from a wide variety of sources. Possibilities include metals that might be found as pigments in paints (such as titanium, molybdenum, lead, and iron), or metals that occur as traces in, or as major components of, wallboard, concrete, aggregate, copper piping, electrical wiring, and computer equipment."[3]

In a second example, researchers at the U.S. Environmental Protection Agency (EPA) measured the concentrations of 60 organic compounds in air samples from Ground Zero using an organic gas and particle sampler. The presence of one of these compounds, 1,3-diphenylpropane, has been suggested as evidence of thermite, a highly-reactive pyrotechnic material believed by some to have played a role in the WTC collapses. However, the authors of the EPA paper state in the opening paragraph that although "... this species has not previously been reported from ambient sampling ... it has been associated with polystyrene and other plastics, which are in abundance at the WTC site."[4]

Finally, you ask about FEMA's report of a "severe high-temperature corrosion attack." In Appendix C of the FEMA report, limited metallurgical analysis of two steel samples—which showed evidence of exposure to high-temperature in a corrosive environment—was conducted. The researchers noted that the rate of corrosion was unknown. Further, they noted that the corrosion could have occurred as a result of "long-term heating following the collapse," or that the corrosion "started prior to the collapse and accelerated the weakening of the steel structure."[5] Finally, it should be noted that origins of the samples were not definitively known. The report states that, "The first appeared to be from WTC 7 and the second from either WTC 1 or 2." Thus, it was not possible to conclusively link the first sample to WTC 7 nor was there other evidence to suggest that such failures occurred in WTC 7 leading to its collapse. Since this phenomenon was observed in isolated instances, it was not studied further.

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[1] World Trade Center Building Performance Study: Data Collection, Preliminary Observations, and Recommendations (FEMA 403), McAllister, T.P. et.al., Federal Emergency Management Agency, p. 5-1 (May 2002).

[2] Ibid, p. 5-30.

[3] Environmental Studies of the World Trade Center Area After the September 11, 2001 Attack. Clark, R.N.; Green, R,.O.; Swayze, G.A.; Meeker, G.; Sutley, S.; Hoefen, T.M.; Livo, K.E.; Plumlee, G.; Pavri, B.; Sarture, C.; Wilson, S.; Hageman, P.; Lamothe, P.; Vance, J.S.; Boardman, J.; Brownfield, I.; Gent, C.; Morath, L.C.; Taggart, J.; Theodorakos, P.M.; and Adams, M. U.S. Geological Survey (November 2001).

[4] Swartz, E.; Stockburger, L.; and Valero, D.A. Polycyclic Aromatic Hydrocarbons and Other Semivolatile Organic Compounds Collected in New York City in Response to the Events of 9/11. Environmental Science and Technology, Vol. 37, No. 16, pg. 3547 (2003).

[5] World Trade Center Building Performance Study: Data Collection, Preliminary Observations, and Recommendations (FEMA 403), McAllister, T.P. Editor, Federal Emergency Management Agency, May 2002, p. C-13 (May 2002).

NIST's response to Freedom of Information Act (FOIA) requests

NIST has published the full text of all of its reports, all public comments received concerning draft versions of these reports, and substantial amounts of supporting materials, including several editions of frequently asked questions, on its Web site at http://wtc.nist.gov.

Section 7(d) of the National Construction Safety Team (NCST) Act exempts from disclosure "information received by NIST in the course of investigations regarding building failures if the Director finds that the disclosure of the information might jeopardize public safety." Indeed, the NIST Director has determined that the release of 3,370 files from the ANSYS® analysis results based on Case B temperature might jeopardize public safety, and therefore, these files have been withheld.

The decision to withhold the data was based on the fact that the capabilities of the WTC 7 collapse initiation and global collapse models are unprecedented, in that *they provide validated models that can predict collapse of typical tall buildings*. If released, these models would provide a powerful tool to groups and individuals interested in simulating building collapses and devising ways to destroy buildings.

Free fall during the WTC 7 collapse

In your May 31, 2010, letter, you inquire about the issue of whether or not free fall speed could be achie[l]ved by WTC 7 at any point during its collapse. We addressed this question in the final WTC 7 report in October 2008.

In the draft WTC 7 report released in August 2008, NIST stated that the north face of the building descended 18 stories (the portion of the collapse visible in the video) in 5.4 seconds, based on video analysis of the building collapse. This time period is 40 percent longer than the 3.9 seconds this process would have taken if the north face of the building had descended solely under free fall conditions. During the public comment period on the draft report, NIST was asked to confirm this time difference and define the reasons for it in greater detail.

The analysis, as reported in the November 2008 final report on WTC 7, [6] revealed three distinct stages characterizing the 5.4 seconds of collapse:

- Stage 1 (0 to 1.75 seconds): acceleration less than that of gravity (i.e., slower than free fall).
- Stage 2 (1.75 to 4.0 seconds): gravitational acceleration (approaching free fall)
- Stage 3 (4.0 to 5.4 seconds): decreased acceleration, again less than that of gravity

This analysis showed that the 40 percent longer descent time—compared to the 3.9 second free fall time—was due primarily to Stage 1, which corresponded to the buckling of the exterior columns in the lower stories of the north face. During Stage 2, the north face descended at nearly free fall speed, indicating negligible support from the structure below. This is consistent with the structural analysis model which showed the exterior columns buckling and losing their capacity to support the loads from the structure above. In Stage 3, the acceleration decreased as the upper portion of the north face encountered increased resistance from the collapsed structure and the debris pile below.

Therefore, the NIST sequence for the collapse of WTC 7—including the 2.25 seconds in which the structure fell at near free fall speed—is consistent with the actual events observed on 9/11.

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[6] NIST NCSTAR 1A: Final Report on the Collapse of World Trade Center Building 7. November 2008, page 45.

The NIST investigation into the collapses of WTC Buildings 1, 2 and 7 was the most detailed examination of structural failure ever conducted. Based on the recommendations from this investigation, two sets of major and far-reaching building and fire code changes have been adopted by the International Code Council (ICC) into the ICC's I-Codes (specifically the International Building Code, or IBC, and the International Fire Code, or IFC). The 40 code changes were adopted less than five years from the release of the final report on WTC 1 and 2, and less than two years following the release of the final report on WTC 7. This is an extraordinarily rapid pace in the code making and approval process—a solid affirmation by the ICC that the work done by the NIST WTC investigation team was of the highest quality and critical to ensuring that future buildings—especially tall structures—will be increasingly resistant to fire, more easily evacuated in emergencies, more accessible to first responders when needed, and most importantly, safer overall.

Sincerely,

Michael E. Newman
Senior Communications Officer