Re-analyzing the Physical Causes for Destruction in the World Trade Center on 9/11

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Abstract

The prevailing analyses that have been made using mechanical models for gravitational collapses of the buildings of the World Trade Center are shown to generally have physical flaws or inadequacies. This includes those in the Reports (about 45) published by the National Institute of Standards and Technology (NIST) Committee of the United States on the World Trade Center (WTC) collapses. These physical flaws can fall into 3 different categories. The first is disagreement with known principles of physics, such as conservation of energy and momentum. The second is important factual discrepancies with observations on how the collapses occurred. This includes ignoring horizontal forces, and modelling the collapses with a "crush-up" phase, for which there is no evidence. The third is oversimplified assumptions, which create inadequacy of the physical model in describing the collapse. The third physical flaw particularly regards efforts to use 1D models for the collapses, which ignores important 3D effects for the stability of the Towers, as well as significant horizontal motion that is observed. These analyses are examined, with efforts to point out these physical flaws and limitations of model solutions, as well as their implications. Discussion is made of what the ignored effects show and suggest as the causes, and the multiple rectifications needed in analyzing the collapses before mechanical modelling can provide correct insight into how the Towers and Building 7 fell.

Scientific Analysis of the World Trade Center Collapses

Most of us remember that fateful day on September 11, 2001, when the World Trade Center Towers (WTC) in New York City were attacked by terrorists with plane collisions. Several scientific analyses have been developed since to try to explain how the North and South Towers collapsed.[1] *Bazant and Zhou* developed a simple model in 2002 for the Towers collapses called the "crush-down, crush-up" model [1]. In this model gravitational collapse initiates at some height along the tower, cascades into successive collapses at lower and lower points on the tower ("crushing-down"), and continues until the point where the building material at the location of the collapse

initiation hits the ground, whereupon the rapidly moving uncollapsed part of the tower above that collapse initiation point starts crushing from the ground up because of collision of its front with the crushed material on the ground ("crushing-up").

That model played an important role in orienting subsequent studies by the National Institute of Standards & Technology (NIST) Committee towards concentrating their analysis on aspects of fires and fire safety in their Final Report (2005) on what caused the Towers to collapse. They also strongly concentrated their analysis on fires in the NIST Committee's recent 2008 report which they made on this model for how and why Building 7 of the WTC also collapsed [2-3]. Unravelling the essential physical processes involved in the building collapses requires modelling that correctly analyzes that physics. But how well do these modelling studies correctly analyze the physics of the collapses?

In their recent work on this model for the collapse of the Towers, *Bazant and Verdure* [4] further developed the "crush-down, crush-up" model by introducing and solving 1-dimensional equations for the dynamics claimed for the collapses. *Seffen* [5] extended this analysis by reformulating the "crush-down, crush-up" model into a 1-dimensional Lagrangian for the dynamic wake of the collapse and solving it. Both *Bazant and Verdure* and *Seffen* analyze similar scenarios for how the Towers collapsed. The basic cause of the Tower collapses they analyze (*Seffen* states that it is "well-established") is that:
(1) intense fires created by the aircraft compromised the remaining intact columns near the impact [those undamaged by the plane collision] to sustain the weight of the buildings above them.
(2) The subsequent "near free fall" of these upper parts over just 1 story resulted in dynamical overloading of the undamaged columns below (*Seffen* states, by a "factor of over 30").
Bazant and Verdure develop the mechanical details and equations for how these collapses occurred, while *Seffen* mathematically converts the equations to develop a propagating instability model for how the fire brought the towers down. But these claimed factors on the collapses of the Towers are factually inaccurate. Furthermore, in the models and their analyses ideal assumptions are made that are in disagreement with physical principles inherent in the collapses of the Towers, and yield solutions that cannot provide correct insight into how the Towers collapsed. The essential physical issues in these modelling analysis by *Bazant et al.*, by *Seffen*, and by the NIST Committee are addressed in the following subsections.

1. Flaws in the "Crush-down/Crush-up" Model

The "crush-down/crush-up" model does not describe well what actually occurs in the building collapses of the WTC. The theoretical model was proposed initially by *Bazant and Zhou* [1] and has been used in several analyses published on the Towers collapses, but does not agree very well with the collapsing Tower observations. Neither Tower's collapse ended with a "crush-up" phase. The initiation of the WTC Towers'

collapses can be seen in Figures 1 and 2. Figure 1 indicates there is rapidly-moving material below the fires moving *horizontally* on the South Tower, whereas Figure 2 shows dust and fires moving roughly horizontally outside the North Tower. Neither initially starts "crushing down". In fact, Figure 3 shows that it the top segment of the South Tower that collapses first, whiles Figures 1 and 2 show **both** of the Towers have major horizontal forces in their collapses, forces which are ignored in the "crush-down, crush-up" theory, which treats the downward gravitational force as the only force acting in 1D analyses of the collapses.

Furthermore, as Figure 3 of the South Tower collapse shows, the top part of the South Tower does not even come close to "crushing up" after the bottom part of the tower "crushes down" to the ground [6]. In fact the top part started toppling, then actually collapsed *down* and fully disintegrated into gray clouds (produced from pulverizing concrete from regions that had been on fire) in mid-air, all while still **above** the standing lower part of the tower (the segment producing only white clouds from pulverizing concrete below where the fires were), and it did so *well before* the lower segment collapsed down.

The factors that caused the onset of collapse in the South Tower appear most definitely to **not** have been the fires. The fire created from the plane impacts were not that intense just before the collapse initiation for either Tower, and for the South Tower the fires seemed close to being contained and put out by the firemen when suddenly rapidly horizontally-moving masses of material violently broke through walls of the floors **below** where the fires had been burning from the plane hit. As Figure 1 shows, the collapse of the South Tower initiated *1-2 stories below* the lowest floor where the fires had been burning, with very dynamic (roughly 40 mph) hurtling of material in the horizontal direction away from the building. There is **no** fire associated with this rapid horizontal hurtling of white material (broken and pulverized concrete) away from the building. This and a subsequent horizontal ejection at nearby floors of faster-moving white material (which will be seen in Figure 6) formed the white clouds around the lower segment.

There is similar evidence that the fires were not have been the cause of the North Tower collapse, such as the energy analysis in *Hoffman* [9], that calculates the amount of energy expended in the collapse of the North Tower to be about an order of magnitude larger than the energy that is available for gravitation collapse. These analyses basically disprove the "well-established" assumption that gravitation was the only significant force involved in the collapses of the Towers.

For the North Tower, the whole top segment was involved when the collapse started. As shown in Figure 4, the 360 foot antenna on top of the North Tower was one of the first things to start collapsing when the Tower collapse started. When this happened, large smoke clouds and significant fireballs were coming out of the top segment into the air in a horizontal direction. Clearly the factors responsible for the onset of collapse do not correspond to the assumptions in this "crush-down, crush-up" theory for this case either.

Figure 1: South tower (on the left-hand side) 56 minutes after a jet collides with floors 79 through 85, in which the rapidly-moving horizontal bursts of material travel roughly 40 mph outside of the 77-78th floors from which they were ejected, which was 1-2 floors below that lowest floor on fire [6]. There is clearly no fire in the ejected material. Fires did not produce this horizontal ejection, and the source of that momentum in the horizontal direction is not accounted for in the in all the NIST Committee studies. This and a subsequent horizontal ejection at nearby floors (shown in Figure 6) of rapidly-moving white material appears to form the white clouds like those in Figure 3, while the top smoke-filled segment starts rapidly collapsing moments later, producing the gray clouds like those in Figure 3. Note that the sudden leaning of the top segment of the Tower at close to 9° , which also does not show any evidence of being produced by the fires.

Figure 2: Perspective from North side at very initial start of collapse of the North Tower, with dust and smoke clouds very rapidly spreading out nearly horizontally, and flames at the edge of the building beginning to emerge outside the building.[7] The fire had been burning internally and steadily for 1.45 hours before this sudden eruption.

Figure 3: View of the South Tower (left-hand side) collapse just over 3 s after Figure 1, in which the top of the top segment of the Tower is collapsing below the bottom smoke line of the North Tower (right-hand side).[6] Over 50% of the top segment has collapsed and disintegrated at the bottom of that top segment, with the pulverized concrete coming out in the expanding gray clouds, while *never moving down to or below the level of collapse initiation* (near the top of the white clouds). The top of the top segment has dropped almost 200 ft in the under 3 s since it started dropping, suggesting a force in addition to gravity is causing it to drop. The lower segment is just starting to collapse at its very top, with pulverized concrete going into the white clouds. Nothing like a "crush-up" phase occurs for this top segment, since it never follows the bottom segment down to the ground, and collapses *before* the "crush-down" phase.

Figure 4: Heavy smoke and unusual flame emissions rapidly coming roughly horizontally out the side of the North Tower's top at velocities around 30 ft/s at the initiation of the collapse of the building, which is 0.75 s after Figure 2 [7]. Note also the antenna at the top center of the building is undergoing toppling from its position in Figure 2, implying the center of the building has a significant horizontal motion, whereas the building has not started "crushing-down". These facts are not discussed in the NIST Final Report on the collapse of the Towers.[2]

2. Errors in Claims Gravitational Collapse can Achieve near Free-fall

Both *Bazant and Verdure* [4] and *Seffen* [5] build on the "crush-up, crush-down" model introduced in *Bazant and Zhou* [1]. *Seffen* specifically refers to their work as establishing the close to "free-falling" upper parts that initiated the collapse, even though *Bazant and Zhou* provided no physical mechanism that can possibly allow such free-fall.[1] Their collective claims are that the subsequent gravitational free-fall of the upper parts over the height of just one story resulted in dynamical overloading of the undamaged lower columns by many times their static load. But there is *no* evidence to support the incredible claim that upon this initiation the upper parts were suddenly (within 1 story or so) virtually free-falling. For that to happen, the solid material making up the building *below* these sections where the collapse initiates would suddenly effectively "liquefy" to provide virtually no resistance to fall, an action the fire **above** this solid material *cannot* possibly do. That lower contiguous material counters falling parts from above, and conservation of momentum keeps the free-fall state from ever being approached.[11]

In fact, most likely the only thing that might create a state close to free-falling is massive explosions well below the fires – massive enough to effectively "liquefy" the lower structure. Direct evidence for explosions, which were created by forces other than gravity that had a substantial component in the horizontal direction, has been presented [10]. Those are of course not present in *Bazant and Verdure*'s and *Seffen*'s models, who explain the collapses as arising solely from the gravitational force.

Bazant and Verdure [4] and *Seffen* [5] completely ignore conservation of momentum in all their claims that the Towers can collapse gravitationally at close to the "free-fall" rate [11]. *Bazant and Verdure* estimate the typical collapse rate in their "crush-down. crush-up" model, in which gravitation as the only force, to be $\sim 17\%$ slower than free-fall. *Seffen* has mathematically converted the problem from one of analyzing Newton's equations of motion to an instability analysis of the column as a whole, in order to improve on the the story-coupling limitations of the *Bazant and Zhou* analysis. However, one cannot ignore conservation of energy and momentum, and the implications of these conservation laws is that the free-fall cavalierly referred to *cannot happen* in a solely gravitational collapse of the Towers that were analyzed [11]. Both *Bazant and Verdure* and *Seffen* effectively avoid any discussion of the problem of the conservation laws in their analyses, but the facts of energy and momentum conservation have not gone away. Their collapse models cannot produce the virtual free fall asserted.

The collapse of both Towers was very fast, and they did in fact did move down near the free-fall rate. However, the gravitational collapses analyzed in these studies could not have produced that virtual free-fall. Suggestions they could are all in error.

Furthermore, that rapid collapse of the top segment of the South Tower appears to have been slighly **faster** than gravitational freefall. Note this Figure 3 is only 3 s. after the top of the top segment starts collapsing (Figure 1), and yet the top has fallen $\sim$

200 ft in Figure 3. The most gravity could lower it in that time is 144 ft, and that is only if the top is in complete free-fall, which could *only* happen if the material below the the top has been effectively "liquefied" so that it provides virtually no resistance to the fall. Yet it in fact is not in free fall in Figure 1. To compare a little more carefully, the photo first showing the top segment collapsing is in Figure 5, which was taken 2.3 s. before Figure 3. In Figure 5 it has fallen $\sim$ 50 ft, so it has fallen almost another $\sim$ 150 ft in at the time of Figure 3. But in 2.3 s, gravitational freefall would only allow it to come down 85 ft! Thus the fact that this top has fallen slightly faster than gravitation freefall strongly suggests there is another downward force adding to the gravitational collapse of that top segment. This is in addition to the horizontal forces we have discussed.

What could that additional force in the downward direction be? Well the clear evidence from the sudden horizontal ejection of gray clouds in the top segment (Figure 5) strongly implies a large explosion is taking place in the top segment. That explosion would create a massive overpressure in all directions. The overpressure is relieved much more in the roughly horizontal directions by breaking through the Tower side structure and rapid ejection of the gray clouds. However, the overpressure does not reach or break through the top and bottom of that segment. That overpressure is larger at the top than the bottom because of the downward motion of the segment. Thus the horizontal paths explosively created on the sides are lower pressure, so they then create a subsequently sucking force primarily downward for the remaining overpressure in the vertical directions. Thus the pressure gradient created as an aftermath of that explosion likely caused a follow up an additional downward force inside the top of the tower, which is also pulling the top down in that top segment.

So, the theories of Tower collapse, sanctioned by the United State NIST Committee in its Final Report 2005 Report of Tower collapses, from the plane impacts and fires are not possible because: 1. Conservation of energy and momentum will not let such a fall approach gravitational free fall. Only an explosion effectively liquefying lower structure could allow it. 2. The top segment of the South Tower appears to collapse even faster than free fall. The additional force created by the pressure gradient of an internal explosion explains the observations of this phenomena very well.

3. Flaws in Analyses Ignoring Multi-dimensions of the Collapse

All of the analyses by *Bazant and Verdure* [4] and *Seffen* [5] used 1-dimensional models for collapse, and these analyses concluded that gravitation and fire effects in addition to the plane impacts caused the collapses. A 1-dimensional model implicitly assumes that the effects are homogeneous in the other 2 directions (the cross-section of the tower). But fires are generally so asymmetrical and inhomogeneous that they cannot be accurately represented by a 1-dimensional model. The fire effects clearly would generally be quite inhomogeneous over the large cross-section of the WTC Towers, and as a result of the inhomogeneity of its destruction the resulting gravitational effects are going to be inhomogeneous as well. 1-dimensional models ignore 3-dimensional ef-

fects like horizontal forces, cross-section inhomogeneities, and complex building structure.[8,12] Horizontal forces and complex building structure over the other 2 dimensions were fully neglected in those 1-dimensional analyses.

The horizontal forces and their effects were also ignored in the NIST Final Report in 2005, and their 3D simulation of the fires (which ignored these forces) stopped at the start of the building collapses, in which they claimed the simulations reached "global instability".[2] No confidence can be placed in their conclusions as to what caused the collapse, because they only tested that one model, examining the effects of the fires where gravity was the only force. A careful delineation of many these points of fundamental disagreement on physical principles and observations with that NIST Final Report was presented in the recent paper by *Jones et al* [14].

Bazant and Verdure [4] and *Seffen* [5] represent attempts to express the dynamics of the collapse in terms of equations for the motion. However, these equations are missing important physical processes such as multi-dimensional effects and large horizontal forces [12]. There are several phenomena associated with horizontal forces that occurred in the fall of the Towers, and these not only include the horizontal forces seen in Figures 1, 2 and 4. As presented by *Grabbe* [8], the horizontal force that ripped the South Tower apart at one edge in the collapse was larger in magnitude than the strength of the force of gravity, which is the the sole force in the collapse model used in *Bazant and Verdure* and *Seffen* [4,5]. That horizontal force can be seen by comparing Figures 5 and 6 for the South Tower, which are 0.75 s. apart. That edge is seen to snap and 2 parts of the Tower separate horizontally very near the border between the gray clouds and the white clouds. Significant horizontal forces like this and their multi-dimension effects are completely ignored in the *Bazant and Verdure* and *Seffen* analyses. Both *Ryan* [13] and *Grabbe* [10,12] address these errors. These problems in the analysis are examined in more detail in the next section.

4. Oversimplicities and Errors in Differential Equations

In the recent "crush-down, crush-up" model studies, the 1-dimensional differential equations for progressive collapse analyzed in *Bazant and Verdure* [4], and the 1-dimensional differential equation for dynamical motion of the compressed wake in *Seffen* [5] are solved in these papers to reach conclusions on the building collapses. But fundamental physics of the collapses are missing in both equations because of the neglect of horizontal forces and of the complex 3D building structure. Furthermore, conditions are assumed in these equations that are not physically accurate.

Additional physics processes are important to the models and need to be included in any equation-of-motion analysis. As introduced in the last section, the 2 photos recently presented in a paper on the collapse of the South Tower show occurrences separated in time by 0.75 s (see Figures 5 and 6) [8]. They show that within that 0.75 s effectively the South Tower rips apart at the edge by roughly 50 ft at the bottom of the gray clouds (the Tower is about 209 ft wide) in an approximately horizontal direction.

This shows that the action of a horizontal force that is stronger than gravity, and an additional horizontal force will be required to break the binding of these 2 parts of the Tower before this rapid acceleration apart can occur. This resulting net horizontal force, apparently *much* stronger than the force of gravity, is not present in the equations of *Bazant and Verdure* and of *Seffen*, and has been ignored in these studies [8].

Bazant and Verdure [4] write 1D equations with no horizontal forces for the "crush-down" and "crush-up" phases. This indicates they are not adequate for analyzing the collapses. The towers **cannot** be analyzed as 1D sticks or "telephone poles". Doing so grossly ignores the horizontal extensions of the Towers, and completely misses the internal structure that would be a major resistance to such instabilities that *Seffen* examines. Indeed that 3D internal structure also a major resistance to anything approaching free-fall in these gravitational models. The towers were well-constructed over 44,000 ft^2 horizontally for this stability, and all of that is ignored in the simple 1D model.

Also, Figures 1-4 also show that the "crush-up" phase apparently does not exist for either Tower. On the contrary, they show that the top segment of the South Tower actually collapsed *down* from its top while the Tower below it was still standing. Furthermore, as described in Figure 3 and the text above, the evidence of the collapse of the top segment suggests there is a smaller additional force pulling it downward, making it implode down even faster than gravitational free fall. That additional force would have to come as the pressure gradients created as an aftermath of an internal explosion in the segment. Neither of these phenomena is predicted correctly from the equations in *Bazant and Verdure*.

For the Norh Tower the whole top was involved when the collapse started, including the 360 foot antenna on the top center of the North Tower, which was one of the first things to move when the collapse started. Like the South Tower there was no "crush-up" phase for this segment. Thus the 1D equation for the "crush-up" phase is not only inadequate, but it also describes a nonexistant state.

Seffen [5] correctly identifies one of the several inadequacies of the original *Bazant and Zhou* [1] analysis, saying "However, the link to progressive collapse is improperly asserted by claiming that, because each story locally collapses in an unstable manner, successive stories are bound to fail sequentially." In fact, there is no reason the collapse could not stop, at least temporarily, upon hitting adequately-sturdy structure in the story below. *Seffen* tries to correct that inadequacy in analysis by analyzing whether this is a propagating instability [5]. However, like *Bazant and Zhou* and later *Bazant and Verdure*, he uses a grossly inadequate 1D model of the towers [1].

Seffen's 1D model thus similarly treats the Towers as "telephone poles", grossly ignoring their horizontal extensions and internal structure that would be a major resistance to the instabilities that he examines. That 3D internal structure provides a major resistance to anything approaching free-fall in these gravitational models over its 44,000 ft^2 horizontal extension.

Seffen states the context of the 1D assumption, that "Each story is assumed to compress homogeneously such that the overall 'wake' above the crush-front and below the initiation site has a larger, uniform density."[5] On the contrary, the early stages of the fall of the South Tower were *very non-uniform* over these other 2 dimensions, making a 1D model fully inadequate and generally inaccurate. Using this oversimplied 1D model of the towers, *Seffen* calculates the conditions for the instability in Eq (21) as the maximum value the variable he defines as p^* (non-dimensionalized variable proportional to what he calls the "steady-state propagation pressure" P^*) can be to still "assure collapse" of the building. However, his determination of what p^* is for the Towers is incorrect because of the major oversimplifications from his 1D modele. His calculations predict that when p^* is sufficiently smaller than 1 the collapse rate can achieve the speedy virtual free-fall collapse observed for the Towers, but conservation of energy and momentum in fact shows that result is clearly erroneous.

At the end of his calculations *Seffen* correctly points out some of the limits of his model: "Many simplifications have been made in this analysis for the sake of transparency." He mentions some of these simplifications. However, he fails to describe one of the most crucial oversimplifications of his model: the analysis of the towers as 1D objects. This treatment in all the 1D analysis grossly oversimplified the very inhomogeneous nature of fire throughout the myriad of columns spread over 44,000 ft^2 in those 3D Towers, leading to erroneous conclusions in all such studies [1,4,5].

The large number of columns spread over 44,000 ft^2 clearly shows why the 1D assumption made by these authors is unrealistic as a model for the 3D behavior of the Towers, and ignores essential facts. There were actually about 286 columns in the Towers, and they were designed to deal with fractures in individual columns by redistributing the load to unfractured columns. The 1D model treats the Towers as essentially having only 1 column. This implicitly assumes uniform behavior of all 286 columns, but in fact all these columns are are engineered **not** to act uniformly? Furthermore, this modelled uniform column is treated as being damaged by fire. But the phenomenon of fire damage is *very nonuniform* over these 286 columns occupying this 44,000 ft^2 cross-section of the Towers. The 1D model is grossly unrealistic for the real WTC Towers.

Summary of the Scientific Re-analysis

The WTC collapses certainly *cannot* be described by any of the 1D analyses using the "crush-down, crush-up" model. Analyzing the stability of any building requires a more complex 3D followup. Why has no other high-rise in any industrial nation ever collapsed from fire, in direct contrast to these 1D findings? It undoubtedly has to do with the gross inaccuracies in using 1D models to describe fire or analyze global instabilities for any building fires. One cannot correctly analyze the stability of a complex 3D structure in a simplified 1D analysis, especially in models claiming that fires led to the collapses. Horizontal forces, complex building structure over the other

Figure 5: View of the South Tower at 9:59 AM in its collapse about 0.7 s after Figure 1, right at the beginning of forces starting to separate the top part and the lower part of the tower at its edge [6].

Figure 6: Sudden major rift South Tower edge 0.75 s after Figure 5, caused by one or more powerful roughly-horizontal forces [6]. In that rift, adjacent material in the Tower is suddenly separate by about 40-50 ft (near the break between the white clouds and gray clouds), indicating a force clearly stronger gravity ripped the 2 segments apart and separated them very quickly.[8,12] The physics of this phenomenon has has not been dealt with in any previous models of the collapse. It is not consistent with the gravitation collapse that all the NIST studies concluded explained the collapses, but instead shows a net virtually-horizontal force creating an acceleration almost an order of magnitude larger than the force of gravity. Note the simultaneous appearance of high-velocity bursts of debris, such as the prong of white material on the southern part of the east side that has come out over 100 ft/s.

2 dimensions, and inhomogeneities of the forces of destruction over these 2 dimensions are essential considerations in any correct analysis.

Analyzing the 1D instability of 1500 ft "telephone poles" that *Bazant and Zhou*, *Bazant and Verdure*, and *Seffen* did fails to shed any light on the collapse of the 3D Towers [1,4,5]. While *Seffen* found 1D unstable waves exist on such long "telephone poles", there is no evidence that they can exist over these 286 columns of the complex 3D structure of the Towers for their design. Furthermore, conservation laws imply that fires can never bring buildings down at close to free-fall speed unless they are well-planned in advance with explosives strategically placed to destroy support at crucial points all at the same time, effectively "liquefying" the resistance below so that it cannot stop free-fall. Also, fires are very inhomogeneous, and cannot be described by a 1D model.

This "crush-down, crush-up" model and these analyes of it, applied as an effort to explain what caused the WTC collapses, are decidely wrong and offer no explanation as to how or why the WTC buildings fell. They are all inadequate because they ignore the fundamental 3D nature of the stability of the Towers, they ignore conservation principles that show one cannot produce the virtual free-fall state claimed by solely gravitational forces, disagreeing with known physical principles on both fronts, and they substantially disagree with several observations of the fall of the WTC Towers, including ignoring observed significant horizontal forces.

Many of these inadequacies in analytical modelling efforts also apply to both the NIST Final Report of the Collapse of the WTC Towers, and the NIST Final Report on Collapse of Building 7 of the WTC (finally released late in the summer of 2008), both of which only investigated fires as a feasible cause of the collapses for all 3 buildings.[2,3] Not only do the observed facts contradict the description of the Towers as collapsing from fires, but they also cannot possibly cause the 6.5 s very-symmetrical collapse of Building 7. Building 7 was 580 ft tall, making a gravitational free-fall rate of 6.0 s, so it fell at 7.7% slower than freefall. The scenario for fire collapsing the building so symmetrically and catastrophically at virtually free-fall speed in the Building 7 Report is tantamount to claiming that Maxwell's demon pulled out millions of supports at once and caused it to fantastically maintain the symmetry at millions of points on the top to appear that way. There is a considerable amount of observed physical processes crucial to any investigation that were basically ignored in these studies. Not only do explosions inside the base of the building allow it to fall symmetrically at close to free-fall speeds, but can also account for the slight bowing in the top center of the building as it fell. That explosion would result in a pressure gradient downward force at the center similar to the one discussed above for the top segment of the South Tower, enhancing the acceleration there.

The facts and evidence discussed at length in this paper are supported independently by studies that show extremely high temperatures, much hotter than those that could be produced by fires, were present in those collapses [15, 16]. Those observation of evidence for extremely high temperatures from scanning electron micrographs (SEMs) and x-ray spectroscopy (XEDS) showing the abundance of iron-rich spheres

that could only form at high temperatures, combined with very clear observations of massive amounts of melted iron and good evidence of evaporated iron, strongly support their production by high-temperature explosive processes. The scientific evidence is overwhelming that gravitational collapses from the plane collisions and fires did not and could not happen. The conclusions that they did are incorrect in the United State Government Reports published by the NIST Committee.

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