

Collapse or Explosion? A Discussion of the WTC “Sounds of Explosions” Issue

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31 January 2021*

Abstract

When the Twin Towers of the World Trade Center complex collapsed on September 11, 2001, they exhibited numerous features that several researchers have identified as being consistent with controlled demolition with explosives. However, others have argued that the Towers could not have been destroyed via explosives, noting that the collapse events lacked a critical feature of explosive demolition: sounds of explosions. The absence of these sounds, it’s argued, means explosives could not have played a role in the destruction of the buildings. In this paper, we examine this argument at length and find it to be groundless. We demonstrate that not only can explosive sounds be heard, but that even if this argument were correct, the entire premise of dismissing the demolition hypothesis based on this argument is fallacious to begin with. We also demonstrate that the official investigation into the destruction of these buildings failed to adequately consider this evidence, and therefore renders the conclusions of said investigation unfounded. The theory of controlled demolition with explosives has abundant evidence to support it, and this body of evidence does indeed include the sounds produced during the collapses.

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Introduction

The destruction of the WTC Towers has raised considerable debate regarding the mechanism which ultimately caused their destruction. The theory that currently is the most widely accepted is the one posited by the National Institute of Standards and Technology (NIST). According to NIST, the collapse of the Towers was caused by a combination of the airplane impacts and the resulting fires started by these impacts.¹ NIST's conclusions, however, have been largely challenged by many researchers.² Many of these same researchers posit an alternative explanation as to why the buildings collapsed the way they did; that they were destroyed through some form of controlled demolition with explosives. The evidence for this theory includes, but is not limited to:

1. Fast onset of collapse.
2. Collapse progression straight down through the path of greatest resistance.
3. Collapse accelerates as it progresses.
4. High velocity ejections of dust and debris.
5. Sounds of explosions (both recorded and reported by witnesses).
6. Pulverization of nonmetallic material.
7. Near-total dismemberment of the structure.
8. Chemical evidence of explosives/incendiaries in the post-collapse debris.³

Unsurprisingly, the demolition theory has come under heavy scrutiny by many detractors, and each of the above points has been disputed as being valid evidence for demolition to begin with. While these detractors have been responded to many times and have had their arguments shown to be false,⁴ they have nonetheless continued arguing against the demolition theory in favor of NIST's explanations. However, out of all the points discussed above, the one that may indeed require further clarification is point 5 – the evidence for sounds of explosions. Those who believe the Towers were not destroyed by explosives have repeatedly disputed this point, arguing that the sounds produced as the Towers collapsed do not match with what is commonly heard in controlled demolitions.

Mark Roberts, for example, presents multiple video clips showing buildings being destroyed with explosives, and argues that these events sound significantly different from the video recordings of the Towers' collapses.⁵ Likewise, other detractors argue against the witness accounts of explosions from the Towers, insisting that "One can hear loud sounds and describe them as an [sic] 'explosions' [but] that does not mean that it was explosives creating them."⁶ Simply put, it's argued that "explosion" doesn't always mean "explosive."

This author is in full agreement with an assessment made by the website 911myths.com, which states that:

[T]here's no doubt the collapse (and some events prior to it) involved what looked, and felt like explosions. That doesn't begin to prove that bombs were the cause, though – it'll take considerably more evidence to do that.⁷

As discussed above, we believe this further evidence does indeed exist. We also acknowledge that explosive sounds are not proof in and of themselves that explosives were used. However, the author also maintains that the sound evidence for explosions in the Towers is a significant aspect

to take into account, given that such evidence is quite consistent with the demolition theory, and that several detractors seem to believe it is crucial in deciding whether or not this theory is correct. As far as we can tell, the two main arguments against this evidence can be summarized as follows:

- The sounds produced as the Towers collapsed are not consistent with sounds produced by explosive controlled demolitions.
- The sounds produced as the Towers collapsed, and the subsequent witness accounts of explosions, are not definitive proof that explosives were used.

In this paper, we shall demonstrate that both of these arguments – and their general variations – are not the be-all end-all of the demolition theory that many detractors would like us to believe. We shall argue the following points:

1. The “sound” of an explosion does not in fact define when an event involving an explosive has taken place.
2. The explosive sounds could have been decreased and/or masked in a variety of ways (by means of how the explosives were set off, what types of explosives were used, and where the explosives were placed).
3. The witness accounts of explosions are worthy of further consideration, and that the official investigations should have taken them more seriously.

1. How Important are the “Sounds”?

In their investigation, NIST never seriously considered the possibility that explosives may have been used to bring down the WTC. The subject is hardly discussed within their report on the Twin Towers. Instead, NIST chose to address the subject primarily on their Frequently Asked Questions page.⁸ In discussing their reasons for dismissing the idea that explosives may have been used to destroy the buildings, NIST explained that:

Video evidence also showed unambiguously that the collapse progressed from the top to the bottom, and there was no evidence (collected by NIST or by the New York City Police Department, the Port Authority Police Department, or the Fire Department of New York) of any blast or explosions in the region below the impact and fire floors as the top building sections (including and above the 98th floor in WTC 1 and the 82nd floor in WTC 2) began their downward movement upon collapse initiation.⁹

Most of the above explanation is significantly fallacy-rich, implying that demolitions do not proceed from “the top to the bottom” (when in fact some do proceed that way¹⁰), and that there was no evidence of “any blast or explosions” below where the planes impacted. The point regarding evidence of a “blast” or “explosions” is as about close as NIST gets to discussing the issue of the sounds from the Towers. They provide no quantitative data regarding exactly what types of sounds they believe should have been heard that would imply explosives were used. However, NIST does discuss the sound issue in far more detail in regards to their analysis of World Trade Center 7’s destruction. As well as discussing the idea that Building 7 could have been

destroyed with explosives, NIST explains specifically what types of sounds should have been heard were that to be the case. They write:

[F]or a shaped charge with an explosive weight of equivalent to or higher than 9lb (detonated in a single delay), the noise level at a distance of ½ mile would have been on the order of 130 dB to 140 dB, roughly equivalent to that of a thunderclap directly overhead or an adjacent jet engine [...] People on the street would have heard 9lb of RDX go off a mile away in air (and even further away if the wind were blowing in their direction). There were no witness reports of such a loud noise, nor was such a noise heard on audio tracks of video tapes that recorded the WTC 7 collapse.¹¹

As we can see, NIST specifically identifies the “sounds” of explosions as a key aspect in deciding whether or not explosives may have caused of Building 7’s collapse. But how justified is this argument? Exactly how significant is this issue in deciding whether or not an explosive event has taken place? A review of the detailed literature on this topic reveals the answer; not very. The NFPA 921 *Guide for Fire and Explosion Investigations* is defined as the official document for “establish[ing] guidelines and recommendations for the safe and systematic investigation or analysis of fire and explosion incidents.”¹² In regards to defining what constitutes an event that can be described as an “explosion,” the *Guide* states this in discussing the issue of “sounds” of explosions:

Although an explosion is almost always accompanied by the production of a loud noise, the noise itself is **not an essential element in the definition of an explosion**. The generation and violent escape of gases are the primary criteria of an explosion.¹³ [Emphasis added]

So, according to NFPA 921, the actual “sound” of an explosion actually *doesn’t* define when an explosion has taken place. Instead, it is the generation and violent production of gases that define when such an event has taken place. But how does one conclude that such an event has taken place? The *Guide* further elaborates on what constitutes an explosive event based on the physical characteristics of said event. It states that explosives should be considered a possibility whenever there is “high-order damage,” which NFPA 921 defines as follows:

High-order damage is characterized by shattering of the structure, producing small, pulverized debris. Walls, roofs, and structural members are splintered or shattered, with the building completely demolished. Debris is thrown great distances, possibly hundreds of feet.¹⁴

The first two sentences of this description would apply to Building 7, and the entire paragraph would apply to the Twin Towers. In regards to the aspect of debris being thrown “hundreds of feet,” this undoubtedly happened in the case of the Towers. Analyses show that large steel sections were thrown over 300 feet away from the buildings,¹⁵ while smaller debris was shot out as much as ¼ of a mile away.¹⁶

Even NIST has acknowledged this event to some degree. While no mention is made of the steel being shot out from the buildings in their report on the Twin Towers, NIST does make mention of this event in their Building 7 report, noting that:

[F]ragments [from WTC1] were forcibly ejected and traveled distances up to hundreds of meters. Pieces of WTC 1 hit WTC 7, severing six columns on Floors 7 through 17 on the south face and one column on the

west face near the southwest corner. The debris also caused structural damage between Floor 44 and the roof.¹⁷

NIST therefore acknowledges that sections of steel from the Towers travelled distances of at least 650 feet (since “hundreds of meters” would mean at least 200 meters, which would be about 650 feet). And this debris must have been extremely heavy, given that according to NIST it was able to sever seven steel columns in WTC7. So, in terms of their physical appearance, the Towers’ collapses seem to fit the definition of an explosive event quite well – which in turn should have been sufficient reason to properly investigate whether or not explosives may have been used to bring them down. The NFPA 921 *Guide* further explains how such an investigation should be conducted, noting that:

Chemical analysis of debris, soot, soil, or air samples can be helpful in identifying the fuel. With explosives or liquid fuels, gas chromatography, mass spectrography, or other chemical tests of properly collected samples may be able to identify their presence.¹⁸

In other words, chemical analyses for residues of explosives should be undertaken in such an investigation. But NIST itself has admitted that it in fact never carried out such tests in its investigation.¹⁹ On what grounds did NIST refuse to do this? Although they maintain that such analyses “would not necessarily have been conclusive,”²⁰ they therefore leave open the possibility that such analyses would not necessarily have been *inconclusive* either.

While the procedures described in the NFPA 921 *Guide* are not mandatory for all investigations, it notes that deviations from its recommendations “need to be justified.”²¹ The author is unable to find any rational justification for NIST’s failure to follow several important procedures described within the *Guide*. Even though NIST maintains that it did follow such standards in its investigation,²² nothing within their reports suggest they followed crucial procedures in regards to identifying whether or not explosives were used. They have admitted that no chemical analyses for explosives were conducted on their part (contradicting Section 21.15.2 of the *Guide*), even though they acknowledged that several features of the buildings’ collapses match extremely well with what the *Guide* itself defines as an explosive event. Instead, NIST chose to identify the “sound” of an explosion as a necessary factor in deciding whether or not explosives were used, even though the *Guide* specifically denies that this feature defines an explosive event in the first place.

The most important fact we can take away from all of this is that the “sound” of an explosion is not actually needed in order to define when an event involving explosives has taken place. NFPA 921 explains several ways in which analyzing the possible use of explosives can be done, but as we’ve seen NIST evidently ignored these suggested procedures and used their own fallacious reasoning in their investigation. While sounds can be helpful in determining if explosives were used, there are far more direct and obvious ways such analyses can be carried out. Just as detractors argue that an “explosion” doesn’t always mean “explosives,” the author feels justified in putting forth the reverse argument; that the “absence of explosion sounds” doesn’t always mean “absence of explosives.”

2. Can Explosive Sounds be Decreased and/or Masked?

Although we've demonstrated that explosive sounds are not required to define an event as involving explosives, we maintain that such sounds can in fact be heard in the audio of videos of the Towers' collapses. But several detractors disagree, asserting that the sounds produced as the Towers collapsed do not match with what is commonly heard in controlled demolitions. For example, the State Department links²³ to a video titled "9/11 Debunked: Controlled Demolition Not Possible,"²⁴ which asserts that:

If explosives were used on each floor of the World Trade Center, a succession of distinct explosions would be heard miles away. Yet, even at the base of the building, not a single explosion is heard.

In this section, we will show that such assertions are groundless, as they fail to take into account the numerous ways that the sounds of explosions could have been masked and/or decreased in the demolition of the Towers. There are three ways this could have been accomplished; how the explosives were set off, what types of explosives were used, and how the explosives were placed in the structures.

2.1 Rapid Detonation Sequence

There are two key problems with the above assertion. First, as we will see in section 3, there were in fact numerous witnesses to explosions from the Towers, and the sounds *could* be heard miles away.²⁵ The second problem is the assertion that the sounds of the explosions would necessarily be heard as "distinct" events. This, however, is not strictly true. This aspect of demolition is generally only observed in buildings brought down through what we could call a *traditional* controlled demolition. In their attempts to cast doubt on the validity of the demolition theory, several detractors argue that since the collapse of the Towers does not match exactly with what is seen in traditional demolitions, this weighs against the idea that explosives were used to bring the buildings down. However, as explained at 911review.com:

Defenders of the collapse story have suggested that differences between the Twin Towers' destruction and conventional building demolitions weigh against controlled demolition being the cause of the former [...] The fact [that] the destruction of the WTC skyscrapers differed in certain ways from commercial demolitions has little to do with whether they were demolitions. A controlled demolition is the engineered destruction of a structure, and there are many ways to accomplish such, whatever the technical demands [...] A demolition that is planned as part of a covert operation to fit a narrative of events that attributes the total destruction of the building to a different cause (such as a jetliner crash and consequent fires) has a very different set of requirements than a demolition that is planned to legally remove a building in an urban setting.²⁶

The fact of the matter is that explosives can be used to bring down a structure in a variety of ways, not being restricted to the conventional method by which buildings are usually taken down. All that is required for the destruction of a building to be classified as a controlled demolition is for the structure to be destroyed by means of an external force consciously being used and controlled by individuals for a specific purpose. That's why it's called *controlled* demolition. And one aspect of the Tower demolitions evidently involved the sequence in which the explosives in the buildings were set off.

In a traditional demolition, explosives are generally set off in a particular sequence wherein their detonations are spaced out enough so that most of them can be heard distinctly from one another. When asked why explosives are usually set off in intervals, Stacey Loizeaux, the daughter of Controlled Demolition, Inc. president Mark Loizeaux, explained that:

[I]f I kick both your legs out from under you, you're going to fall right on your butt. If I kick one leg out from under you, you'll fall left or right. So the way we control the failure of the building is by using the delays. And, again, that varies structure to structure and depending on where we want the building to go.²⁷

The following videos of demolitions highlight this point.

- J.L. Hudson Department Store Implosion: <http://www.youtube.com/watch?v=-rcctmcxGwM>
- Landmark Tower Implosion: <http://www.youtube.com/watch?v=79sJ1bMR6VQ>
- Seattle Kingdome Implosion: <http://www.youtube.com/watch?v=kFz22x-WvrE>

However, this evidently wasn't the case for the demolition of the Towers. In order for the Towers to have been demolished while at the same time appearing to most people as purely gravity-driven collapses, the explosives would needed to have been set off in rapid succession down the vertical axis of each building, gradually breaking apart each structure. Instead of breaking up the structural supports of the buildings more or less all at once (the usual sequence for a traditional demolition), the explosives would have been set off over an extended duration in order for the buildings to appear that they were being destroyed by the falling building sections above where the planes impacted. Had sections of the Towers below the so-called "crush front" started breaking up before the crush front reached those levels, the illusion of a gravity-driven collapse would have been destroyed, thus further exposing the fact that the collapses were being caused by explosives.

Furthermore, setting off the explosives in such a way would have masked the sounds of explosions by preventing them from being heard as distinct events. As explained by Jim Hoffman:

[T]he reason I think people don't think of [the Towers' collapses] as explosions is because they occurred over a period of fifteen seconds in either case [...] Normally people think of an explosion as you hear a loud crack, a bang, and then it's just that one event. But if, in the case of a demolition where you might have thousands of explosions that are all blending in, then you get one, huge explosive event. But you don't hear any distinct explosions because there's so much above the roar of it.²⁸

As a general rule, the faster a sequence of loud events is, the more difficult it can be to interpret the distinct sound of each said event. Take for example the video below, which shows thousands of firecrackers being set off in rapid succession.

<http://www.youtube.com/watch?v=leR1EAdls4Y&t=00m39s>

Now compare this with what can be heard in the below video of the South Tower collapse.

<http://www.youtube.com/watch?v=DqiqVVpY62A>

While subjective interpretations may vary, the author feels that the sounds produced within both of these videos are very similar.²⁹ Both seem to feature what could be described as a continuous “roar” or “wave of sound,” rather than any distinct single noise or noises. By setting off explosives in such a rapid sequence, the difficulty of interpreting each explosion as a distinct event would increase dramatically. Thus, if the explosives in the Towers were set off in this fashion, this would have prevented the explosives themselves from being recognized as distinct events occurring within the buildings. As summarized at 911review.com:

The towers’ destruction cannot be accurately described without the word “explosion.” Huge clouds billowed out from the towers, starting around the crash zones, and grew rapidly as they consumed each tower, converting them to fine powder and fragments of steel, and depositing the bulk of the remains outside of each tower’s footprint in a radial pattern [...] One of the key underpinnings of that denial [that the buildings were demolished] is the fact that the explosions were continuous, extending for the entire 15-second duration of each tower’s collapse. Although witnesses describe loud pops at their onsets, the extended duration and loud roar of the explosions apparently prevented most people from thinking of them as explosions.³⁰

2.2 Types of Explosives Used

Another way in which the sounds of the explosives could have been hidden is by having the sound levels themselves decreased. But is such a thing possible? Many detractors argue that any process that decreases the sound level of an explosive also decreases the effectiveness of said explosive. For example, one poster at the “International Skeptics Forum” (formerly the JREF forum) asserts that:

Explosives act by overpressure, which produces both their destructive power (higher explosive power is needed to cut steel than concrete), and the smoke/dust ejection. Reduced noise [means] no squibs. Squibs [mean] deafening loud noise at that very instant (plus the sound propagation delay).³¹

However, there are in fact ways in which explosive sounds can indeed be decreased by means of what types of explosives are used. The traditional explosives that are used in controlled demolitions are called C4³² and RDX.³³ As we previously saw, NIST posited RDX as the most likely potential explosive that would have been used had WTC7 been destroyed by controlled demolition. And based on this, NIST concluded that such explosives could not have been used in the destruction of the building, given that sound levels of “130 dB to 140 dB” (the sound levels produced by RDX) were not heard or recorded.

However, this conclusion revolves around NIST’s own created scenario, in which RDX was the primary explosive used. This is merely a straw-man argument fabricated by NIST, as the leading proponents of the demolition theory have seldom posited RDX as the primary explosive used to bring down the Twin Towers and Building 7. Rather, the two materials largely believed to have been used in the demolition of all three buildings are thermate and nanothermite, which are both variations of the incendiary thermite.³⁴

The idea that thermite may have been used to demolish the WTC buildings was first proposed by D. P. Grimmer,³⁵ and later expanded upon by Dr. Steven Jones.³⁶ Using variations of thermite to destroy the Towers would provide a number of advantages in a covert controlled demolition. For starters, using such material would greatly reduce the risk of any accidental ignition potentially

caused by the impacting airplanes and the ensuing fires.³⁷ Also, given that many of the components that constitute thermite are also generally found in office buildings,³⁸ detecting the presence of such material or the residue it would leave behind would be much more difficult (which in turn would require a more detailed and thorough analysis of the WTC debris³⁹).

A third advantage of using such material – the advantage relevant to the main topic of this paper – is that they can be formulated to demolish steel structures without producing the same types of loud explosive sounds generally heard in traditional demolitions. Thermite and its sulfur-based variant thermate are by definition not explosives, but rather incendiaries. When ignited, neither produce the loud booms and cracks generally heard from demolition explosives, but instead burn gradually without producing much sound. Some critics contend that this fact weighs against the suggestion that either of these materials could be valid candidates for demolishing the Towers, the idea being that they lack the necessary power to accomplish what supposedly only high-energy explosives can. However, such assertions are shown to be unfounded, given two facts.

One is that there are at least two examples of thermite being used to demolish steel structures; the Skyride Tower in 1935, and the steel-framed roof of the Reichstag Building in 1954.⁴⁰ Second, experiments conducted by civil engineer Jonathan Cole have shown that when placed properly on steel columns and beams, thermate can be used to attack steel in a variety of ways, from cutting straight through the steel to simply cutting through the bolt connections.⁴¹ These facts demonstrate that thermate, in its general variations, can indeed be used for demolition when set up correctly.

Of course, it is not merely the capability of thermite to demolish steel structures that critics have challenged. Many have also asserted that thermite and thermate do not have the capability to produce the explosive features exhibited by each Tower as they collapsed. But such assertions are answered by the fact that the other material suggested to have been used to demolish the buildings is nanothermite, which *is* an explosive and not merely an incendiary. There is substantial documentation showing that nanothermite can be formulated as a high-explosive,⁴² meaning that it does have the potential to produce the explosive features observed in the demolition of the Towers. As explained at 911research.wtc7.net:

One of the critiques of theories that thermite was used to destroy the World Trade Center skyscrapers asserts that thermite preparations don't have sufficient explosive power to account for the observed features of the buildings' destruction. This criticism seems to be uninformed by knowledge of some of the aluminothermic preparations known to exist – particularly those being researched for military applications [...] In contrast to the slow-burning behavior of low-tech thermite preparations, various engineered forms of aluminothermic materials apparently have explosive power resembling conventional high explosives while retaining higher energy densities.⁴³

But given the above information, does this mean that, along with the high-explosive power of nanothermite, this also includes the feature of loud explosive sounds? A review of the technical literature shows that this is not necessarily the case. In the paper documenting the discovery of chips of nanothermite in WTC dust samples,⁴⁴ the authors point out that in April of 2001 the American Chemical Society held a symposium on the defense applications of nanomaterials, in which they stated:

At this point in time, all of the military services and some DOE and academic laboratories have active R&D programs aimed at exploiting the unique properties of nanomaterials that have potential to be used in

energetic formulations for advanced explosives [...] nanoenergetics hold promise as useful ingredients for the thermobaric (TBX) and TBX-like weapons, particularly due to their high degree of tailorability with regards to energy release and impulse management.⁴⁵

From this, the authors of the nanothermite study point out that:

The feature of “impulse management” may be significant. It is possible that formulations may be chosen to have just sufficient percussive effect to achieve the desired fragmentation while minimizing the noise level.⁴⁶

Likewise, published literature on this material shows its shockwave characteristics can be “tuned” for various purposes, which may include the reduction of the volume or sharpness of the blast sounds produced.⁴⁷ Therefore, if such explosives were used on 9/11 to demolish the Towers, we have a plausible explanation as to why the sounds produced as the buildings collapsed were not as loud as what is typically heard in controlled demolitions. The author grants that the sounds produced as the Towers collapsed may not have been the 130 to 140 decibels that NIST claims would have been heard had explosives been used. However, to imply that no explosive sounds of any kind can be heard in the audio recordings of the buildings’ collapses is clearly unfounded. Sounds consistent with explosive destruction are audible in the available recordings, and methods of decreasing the sound levels of such explosives do exist.

2.3 Placement of the Explosives

A third way in which the explosive sounds could have been hidden and/or masked has to do with how and where the explosives were placed within the structures. As we’ve established, many detractors dismiss controlled demolition as a viable theory of what caused the WTC buildings to collapse, sometimes by fallaciously refusing to even look at the evidence for said theory. And it seems that much of this backlash has to do with the fact that many researchers within the 9/11 Truth Movement have failed to provide a coherent explanation of exactly how the Towers were demolished. That is, an explanation that includes specific details, rather than just a vague assertion of “the buildings were demolished with explosives.” This explanation would include details such as what types of explosives were used, where they were placed, and how they were detonated.

In section 2.2 we have already identified the potential types of explosives/incendiaries that could have been used in the demolitions; thermate and nanothermite. The next step is to understand the most probable way in which the explosives would have been placed in the buildings and exactly which structural components the explosives were placed on. By doing this we can establish a clearer understanding of how the buildings collapsed and, as is relevant to the main topic of this paper, how the explosive sounds could have been further masked in the demolitions.

In a traditional controlled demolition, explosives in the form of cutter charges are placed directly on steel components of a structure in order to cause it to collapse. When placed on vertical support columns, these charges are generally placed at a roughly 45° angle, which is done to ensure that as the building collapses it falls in a specific direction desired by the demolition crew.⁴⁸



Figure 1: Examples of Demolition Explosives Placed at Angles

It has been suggested by some researchers that this method of demolition was applied to the Twin Towers, as several columns in the debris pile appeared to be cut in a similar fashion.⁴⁹

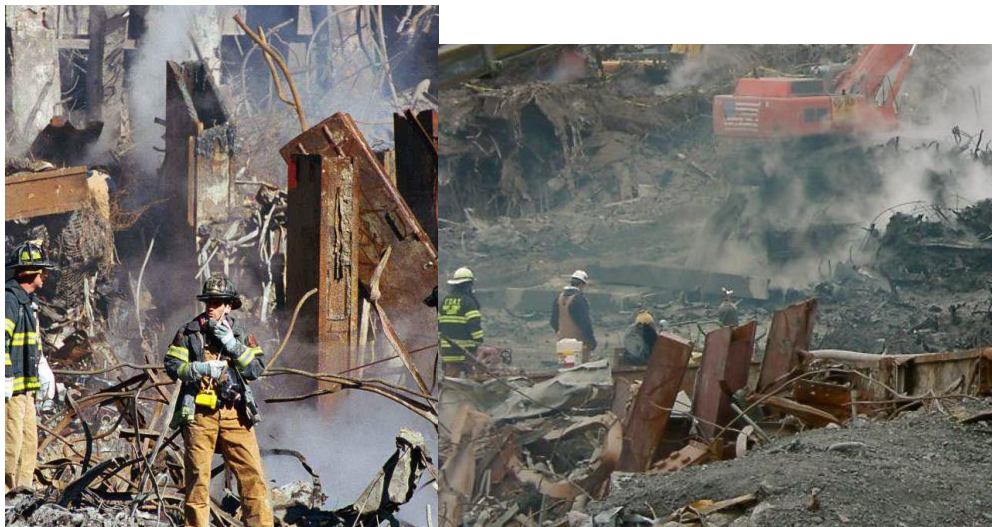


Figure 2: Angled Cut Columns at Ground Zero

However, close analysis of these columns shows that in all probability they were in fact cut by oxy-acetylene torches used in the cleanup operations at Ground Zero.⁵⁰ Using explosives to cut through the Towers' steel columns this way would have been highly risky in a covert demolition, as such cuts could have been recognized by cleanup workers at the site. This would have been especially true considering that Controlled Demolition, Inc. was one of the groups contracted to participate in the cleanup at Ground Zero.⁵¹

By definition, the goal of a covert demolition entails fooling onlookers into thinking that the event is not a controlled demolition, but rather an *uncontrolled* event. Such a procedure would not merely apply to the event itself, but would also need to apply to the aftermath of said event. If the Towers were destroyed through a covert demolition method, it follows that the appearance of the buildings' structural components after the collapses could not show the obvious signs of being attacked by explosives that are commonly seen in traditional demolitions. The explosives would therefore need to attack the columns in a non-traditional manner, which in turn would cause damage to the columns that cleanup workers would not associate with damage caused by explosives (at least not without further examination).

In a presentation given in 2007, mechanical engineer Gordon Ross suggested that the explosives were primarily placed on the weld connections of the Towers' core columns.⁵² This method of demolition (as illustrated below) would entail that the explosives take out one side of these connections, which in turn would cause the column ends to be affected in two ways:

- The column end would have one of its flanges torn away as it falls away from the other column end (given that one side not attacked by the explosive would still be attached to the column).
- The other column end would have one or both of its sides pushed inwards (one side pushed in by the force of the explosion, and the other side pushed in by the flange as it tears away).

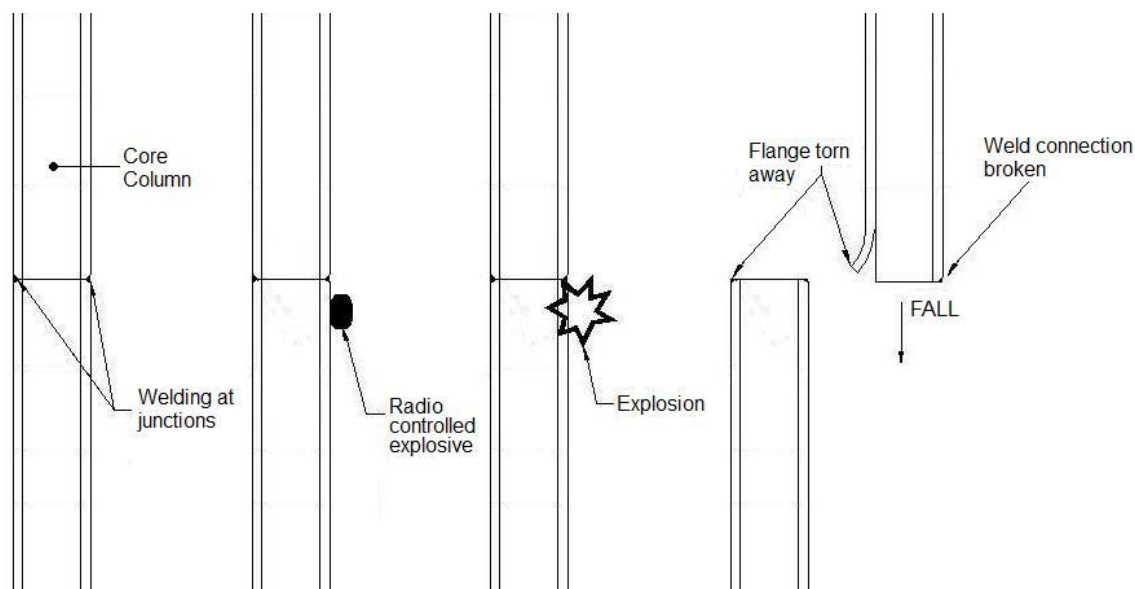


Figure 3: Effects of Explosives on Core Column Sections

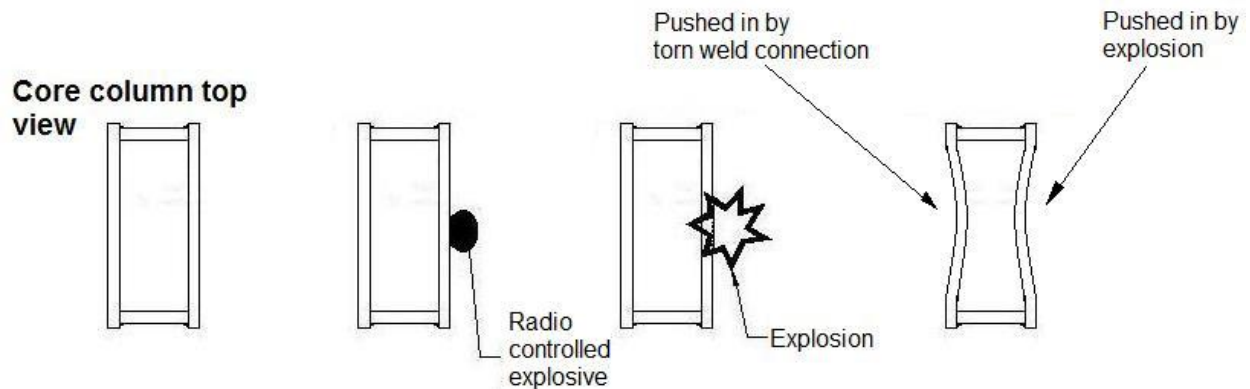


Figure 4: Effects of Explosives on Column End, Top View

After the collapses, many of the core columns in the debris pile exhibited these exact characteristics (see Appendix A for examples). As noted by AE911Truth.org:

Many of the core box columns found in the WTC rubble had concave sides. Most were broken straight across at the weld points. Often, one side of the column's welds were deeply oxidized and even torn away. Explosions ripping across the weld points, as explained by Gordon Ross, offer an explosive hypothesis that demonstrates a mechanism with results resembling observations in the WTC rubble.⁵³

Though a thorough analysis of the columns would be needed in order to be sure this damage was caused by explosives, these effects are described in relevant literature as being consistent with the use of explosives. In describing “deformation” effects of explosives on steel surfaces, one military manual explains that:

The charge's shock wave deforms the surface of the object directly under the charge. When the charge is placed on a concrete surface, it causes a compressive shock wave that crumbles the concrete in the immediate vicinity of the charge, forming a crater. When placed on a steel surface, the charge causes **an indentation or depression** about the size of the contact area of the charge.⁵⁴ [Emphasis added]

Attacking the weld connections of the Towers' columns provides a number of advantages for a covert demolition. As we've established, doing so would inflict damage to the columns that, after the collapses, would be almost unrecognizable as damage caused by explosives. What would further simplify the process is that the explosives need not be placed on every core column in the buildings. Rather, as demonstrated by Gordon Ross, the explosives were evidently only placed on the outer 24 core columns, which would account for why portions of the Towers' cores were seen standing after the collapses.⁵⁵

Furthermore, using the explosives to break the welds provides a solution to two other problems associated with destroying the buildings in a deceptive fashion; the amount of explosives needed and the sounds produced by said explosives. In discussing the placement of the explosives on the core columns' weld connections, mechanical engineer Tony Szamboti notes that:

The amount of explosive[s] needed to provide a concussion powerful enough to break the welds on the core columns is significantly less than that needed to cut through them. These charges could have been tamped to cause most of the energy to go into the column and reduce the noise level. [...] [I]t is feasible to minimize

the percussive noise to a level consistent with that of the collapsing material, while still generating more than enough force to remove the column by breaking the weld.⁵⁶

Thus, attacking the columns' welds directly would reduce the amount of explosives needed and would also reduce the noise levels. As a general rule, breaking an object at its seams requires far less effort than breaking directly through the main body of the object itself. The "tamping" of the explosives described by Tony Szamboti is also very feasible, as such methods can be done with a variety of simple materials, such as sand, clay, or mud.⁵⁷

Based on the data cited above, we can reasonably conclude that detractors' arguments regarding the sound level of explosives are groundless. There are a variety of ways that the sound levels of explosives can be decreased, based on how they are set up, how they are set off, and what types of explosives are used. Any one (or possibly all) of the above cited methods could have been used in the demolition of the Towers, and likely were, given that the audio and visual evidence matches reasonably well.

3. Witness Accounts of Explosions

The final issue to discuss in regards to the debate over explosions at the WTC is the witness accounts of explosion sounds when the Towers collapsed. On 9/11, there were a vast number of witnesses who described the Towers' collapses and the sounds they produced as "explosions."⁵⁸ The most comprehensive examination of these witness accounts was produced by Dr. Graeme MacQueen, in which he documented that 118 first responders testified to hearing explosions as the buildings collapsed.⁵⁹ Such accounts have been regarded by many as powerful evidence of controlled demolition for the Towers. But as with the previous issues we've discussed in this paper, detractors feel there are prosaic explanations for these accounts that do not require explosives being used.

The author finds that there are generally three primary objections to the witness accounts of explosions from the Towers, summarized as follows:

1. The witness accounts are inconsistent with what can actually be heard in the audio recordings of the Towers' collapses.
2. Regardless of their testimonies, the witnesses were simply incorrect in what they perceived, and that the loud sounds they heard were not explosions at all.
3. Even if the loud sounds the witnesses heard truly were explosions, this does not mean that it was explosives that caused them, being that there are many natural forms of explosions that can occur in large fires.

As we shall see, none of these objections hold up in light of the available data.

3.1 Inconsistent Accounts?

The first cited objection to the witness accounts has already largely been addressed in Section 2 of this paper. The sounds produced as the Towers collapsed were consistent with sounds of explosions, although perhaps masked and/or decreased to facilitate a covert demolition scenario. However, another concern raised by those who object to the demolition theory is that many of the accounts are inconsistent and do not corroborate each other. That is, some witnesses speak of hearing only one explosion, while others assert they heard two to three explosions, while others speak of as many as seven to ten explosions.⁶⁰

As previously discussed in Section 2.2, the rapid rate in which the explosives would needed to have been set off evidently prevented many onlookers from interpreting the sounds they heard as explosions. Despite this, many of the witnesses did describe several distinct explosions at the beginning of each collapse, perhaps at a time when the rapidity of the detonation sequence had not yet taken full effect.⁶¹ Several researchers within the 9/11 Truth Movement have explained that explosives were likely not used to initiate the collapses,⁶² but once the upper sections began their downward descent the explosives were evidently set off at the lower levels of the buildings in order to ensure the collapses continued to progress through the rest of the structures.

But given the fact that some discrepancies exist within the witnesses' testimonies, does this weigh significantly against the idea that such testimony can be used as evidence for explosions from the WTC? Given the inordinate number of explosives that would have been set off during the Towers' demolitions, it should not be surprising if the witnesses' accounts differ in regards to how many explosions were heard. Most people were in a complete state of shock when the buildings collapsed, and would have been far more concerned with the buildings' overall destruction rather than keeping count of exactly how many explosions occurred. After all, witnesses to a known controlled demolition would likely not be able to recollect exactly how many explosions were heard as the building was destroyed. Graeme MacQueen, in discussing these types of discrepancies, has written that:

[T]here are apparent inconsistencies: one person will refer to a single big explosion, another will say there were three explosions, while yet another will claim to have heard seven. I have made no attempt to sort out all these claims and cannot pretend to know if they are ultimately compatible. But, on the other hand, I cannot read this material without being struck by the ways in which the witnesses' testimony is not merely cumulative but complementary and multidimensional.⁶³

Although there appears to be some inconsistencies in the accounts of explosions, the fact that there exists this much testimony of explosions on 9/11 should have been reason enough to test for explosive residue at Ground Zero. If, in a murder investigation, an individual claims to have heard a single gunshot, but others claim to have heard three, and others claim to have heard seven, the police would still investigate if a gun was used. Regardless, many of the witness accounts do in fact corroborate each other very well, not only in terms of what they heard, but also what they saw as the buildings came down. In discussing accounts given by firefighters Dennis Tardio and Pat Zoda, Graeme MacQueen observes that:

Tardio and Zoda repeatedly affirm each other's accounts, both with words and with hand gestures. The hand gestures are like a series of karate chops starting high and going quickly downward. The witnesses evidently want to suggest that there were many discrete, energetic events that they observed, and that these started high

up and then moved rapidly down the building at regular intervals. [...] These are firefighters and they are used to encountering the standard sorts of explosions that occur in building fires. But they do not talk about smoke explosions, or “boiling-liquid-expanding-vapor” (BLEVE) explosions, or any of the other expected forms of explosion. Instead, they are talking about something altogether different. They say that what they saw resembled a controlled demolition.⁶⁴

Tardio and Zoda’s accounts are as follows:

Tardio: We made it outside, we made it about a block.
Zoda: We made it at least 2 blocks.
Tardio: 2 blocks.
Zoda: and we started runnin’
Tardio: (hand gestures) poch-poch-poch-poch-poch-poch-poch
Zoda: (hand gestures) Floor by floor it started poppin’ out...
Tardio: It was as if as if they had detonated, det...
Zoda: yea detonated yea
Tardio: as if they had planned to take down a building, (hand gestures)
boom-boom-boom-boom-boom-boom-boom-boom...⁶⁵

Some critics reject the above account given by these men, insisting that they are not literally speaking of the buildings being demolished with explosives, but simply speaking in similes to describe their experiences. As one author writes of their accounts:

In the context of reading it on a conspiracy site, this may sound like damning evidence. They are saying “detonated” and “they had planned to take down a building”. They even say “Boom” to describe the sound. But if you hear the other things they’re saying, view their body language and consider the context outside the conspiracy theory setting, something else emerges. Before or after every description is “**As if**”. “**As if** they had planned to take down a building”. “**It was as if as if** they had detonated”. They also use body language to show it was the sound of the floors crashing into one another.⁶⁶ [Emphasis in the original]

However, the account of another individual not only corroborates Zoda and Tardio’s accounts, but also shows that their descriptions lend far more credibility to the demolition theory rather than to any natural collapse theory. That individual is Paul Lemos, who on 9/11 described the building’s collapse very similarly to how Tardio and Zoda described it. As Graeme MacQueen notes:

Lemos was interviewed on videotape on 9/11 near the World Trade Center, with WTC-7 still standing in the distance. He was filmed by a different film maker at a different location than the firefighters just described. This footage appears to be *entirely independent of the Tardio/Zoda footage just discussed*. However, when Lemos begins describing the demise of the North Tower, he uses the same hand gestures as Tardio and Zoda: rapid chops that start high and move at regular intervals down the building.⁶⁷ [Emphasis in the original]

Lemos told a reporter that:

All of a sudden, I looked up and about twenty stories below [...] the fire I saw, from the corner, (hand gestures) boom, boom, boom, boom, boom, boom, boom, boom, boom. Just like twenty straight hits, just went down and then I just saw the whole building just went “pshew.” And as the bombs were going people just started running and I sat there and watched a few of them explode and then I just turned around and I just started running for my life because at that point the World Trade Center was coming right down.⁶⁸



Figure 5: Tardio, Zoda, and Lemos Describing WTC Collapse

While taking note of these similar accounts, Graeme MacQueen further observes that:

Lemos is even bolder than Tardio and Zoda, in that he does not qualify his statement by saying “*as if* they had detonated.” He refers openly to “bombs” and he says he watched them “explode.” In any case, the Tardio/Zoda footage and the Lemos footage are both rich in detail and mutually corroborating. The rich detail is apparent from the transcript, and the corroboration comes not just from the language used but also the hand gestures. These men clearly perceived the same event and came away with the same idea – that explosive devices in the buildings were used to bring them down.⁶⁹ [Emphasis in the original]

Ultimately, while some of the accounts may contain inconsistencies, the similarities we observe within many of the witnesses’ testimonies are the vital components of this issue that should be focused on. The similarities we find in the witnesses’ accounts is what identifies them as a trend that is worthy of further investigation. What the witnesses say they heard matches well with what can be heard in the audio recordings of the Towers’ collapses, and therefore should be seen as further corroborating evidence of explosions coming from the buildings.

3.2 Loud Sounds are not always Explosions

Out of all the objections raised against the witness accounts of explosions, the next two are the only ones that the author feels are most credible and certainly worthy of consideration. The first of these objections is that the loud sounds the witnesses heard were simply not explosions at all, but rather any number of phenomena inside the Towers which could have produced loud booming sounds. Events such as falling elevators, steel breaking, floors collapsing onto one another, and even human bodies hitting the ground could have all sounded like “explosions,” and therefore could have caused witnesses to report the events as such. While these events certainly could produce sounds similar to explosions, we can safely rule out such possibilities by examining not only the sounds themselves, but also *the effects that followed the sounds*.

On 9/11, Port Authority police officer Sue Keane was in the North Tower of the WTC helping occupants evacuate the building. While helping one individual down the stairs to the mezzanine level, she described enormous explosions that she not only heard, but also felt the effects of. Part of her account is as follows:

A couple of minutes later, it sounded like bombs going off. That’s when the explosions happened. I could hear it coming, and I knew something was going to happen. I braced myself. It started to get dark, then all of a sudden there was this massive explosion. We were on the mezzanine, which is all encased in glass. The windows blew in, everything went black, and we all got thrown.⁷⁰

Her description of the effects of this event is rich in detail, and demonstrates that what she experienced was in all probability the result of explosions caused by explosives.

In his book *Practical Bomb Scene Investigation*, former FBI explosives expert James Thurman describes the primary effects of “chemical explosions as they relate to the initiation of explosives.” In addition to sounds, Thurman lists several other effects,⁷¹ including:

- Positive blast pressure
- Partial vacuum during positive blast pressure
- Negative blast pressure
- Thermal effects
- Fragmentation

When we examine the details of Sue Keane’s account, we find that her experience matches extremely well with these effects:

Positive blast pressure: “The windows blew in [...] and we all got thrown.”⁷²

Partial vacuum during positive blast pressure: “There was this incredible rush of air, and it literally sucked the breath out of my lungs.”⁷³

Negative blast pressure: “Everything went out of me with this massive wind [...] Stuff was just flying past. Then it stopped and got really quiet, and then everything came back at us. I could breathe at this point, but now I was sucking all that stuff in, too. It was almost like a back draft. It sounded like a tornado.”⁷⁴

Thermal effects: “A firefighter [...] threw me under this hose, which in a way felt great, because I didn’t realize until then that my skin was actually burning. I had burn marks, not like you’d have from a fire, but my face was all red, my chest was red [...]”⁷⁵

Fragmentation: “[F]or three or four days there was still stuff coming out of my body like you wouldn’t believe. It was like shrapnel. It’s still coming out. I’ll look over and have this pinpoint under my skin and it will be bleeding.”⁷⁶

Many other individuals at the WTC site experienced these effects as well,⁷⁷ further demonstrating that what the witnesses described was most likely caused by explosives rather than non-explosive phenomena. Given the witnesses’ reports of explosions from the Towers *and* the above cited effects, there is no basis for denying the possibility that explosives may have contributed to the collapse of the buildings. However, we find that in NIST’s investigation, that is exactly what was done.

3.3 “Explosion” Doesn’t Mean “Explosives”

The last objection to the witnesses’ accounts of explosions that the author feels is worthy of serious consideration is that the explosions the witnesses reported were not necessarily the result of explosives. That is, the Twin Towers were on fire before they collapsed, and there are many natural forms of explosions that can take place in a building fire. Such natural explosions could be caused by electrical generators, jet fuel vapor, pressurized containers, or any other material or objects that may explode when exposed to extreme heat. However, there are two primary problems with concluding that the explosions the witnesses described could have been caused by such prosaic explanations.

First, while such phenomena could certainly occur on the Towers’ floors that were set on fire, this would not account for the explosive events that occurred well below where the planes impacted. Several witnesses (such as Paul Lemos) described explosions racing down the vertical axis of the buildings, not merely occurring where the damage and fires were located. Others described explosions that distinctly occurred well below where the planes impacted. For example, firefighter Edward Cachia testified that:

As my officer and I were looking at the south tower, it just gave. It actually gave **at a lower floor, not the floor where the plane hit**, because we originally had thought there was like an **internal detonation explosives because it went in succession, boom, boom, boom, boom**, and then the tower came down.⁷⁸
[Emphasis added]

Firefighter Timothy Hoppey gave a similar account, stating that:

[T]hat’s when we heard the rumble. I looked up, and it was just a black cloud directly overhead. At that point I was thinking it was a **secondary explosion**. It looked to me like **it was much lower than where the planes had gone in**.⁷⁹ [Emphasis added]

And firefighter William Reynolds testified that:

After a while, and I don’t know how long it was, I was distracted by **a large explosion** from the south tower and it seemed like fire was shooting out a couple of hundred feet in each direction, then all of a sudden the top of the tower started coming down in a pancake...

Q. Bill, just one question. The fire that you saw, where was the fire? Like up at the upper levels where it started collapsing?

A. It appeared **somewhere below that. Maybe twenty floors below the impact area of the plane**.⁸⁰
[Emphasis added]

Second, none of the above-mentioned natural explanations would possess the required power needed to contribute to the collapse of the buildings in the first place. Events like electrical or combustion explosions could potentially destroy structures such as wood frame houses, but the energy needed to destroy steel structures as strong and robust as the Towers would have been far in excess of what was available from these prosaic explanations. The only explosions known to have completely destroyed steel-framed high-rise skyscrapers are those caused by explosives. However, at least one theory has emerged in recent years that actually does attempt to explain how natural explosions in the Towers *could* have contributed to the collapses.

In 2011, Norwegian scientist Dr. Christian Simensen proposed the idea that molten aluminum from the airplanes reacted with water inside the Towers, which in turn caused violent chemical reactions that produced the explosions heard by the witnesses and that destroyed the Towers. As noted by a press release of this theory:

The impacts triggered massive explosions and fires, but the subsequent collapse of each tower came as a shock to those watching the disaster unfold.

Blasts heard just before the buildings fell have led to conspiracy theories that explosives were set off inside the towers.

But Dr Simensen believes after crashing into the skyscrapers the two jets would have been trapped within an insulating layer of debris.

As a result, the aircraft hulls rather than the buildings absorbed most of the heat from the burning aviation fuel.

It is then claimed molten aluminium from the jets, flowing down through staircases and gaps in the floors, reacted with water from emergency sprinklers on the lower levels.⁸¹

Unlike the previous prosaic explanations discussed above, this theory does have some evidence to support it, as the technical literature explains that explosions caused by aluminum-water reactions can be extremely powerful. As one article notes:

Whenever two liquids, with widely different temperatures, come into contact, an explosion can result. This is purely a physical phenomenon, but with aluminium there is an additional concern because it is a very reactive element that has a strong chemical attraction for oxygen, as evidenced in its naturally occurring compounds. Just as a large amount of energy is required in reduction cell electrolysis to break down the aluminium-oxygen bonds of its oxide form to produce metallic aluminium. This energy is released dramatically if the metal is able to recombine with the oxygen from either water or air. The energy released when 0.5 kg of aluminium fully reacts with oxygen [...] is equivalent to detonating 1.4 kg of trinitrotoluene (TNT).⁸²

While this idea does seem offer an explanation for both the Towers' destruction and the sounds the witnesses reported, there are a number of problems with Dr. Simensen's theory that renders it as unlikely as all of the previously discussed explanations:

- Dr. Simensen's theory does not account for the inward bowing of the Towers' perimeter columns seen in the videos and photos. According to NIST, this effect was caused by the heating of the floor trusses which were weakened and sagged downward, which in turn pulled on the perimeter columns of each Tower until the columns finally broke. While the author disagrees with NIST's explanation of what produced this effect (as other scenarios can account for it; see note 62), there is no doubt this event happened and is entirely inconsistent with the effects of ANY type of explosion, let alone aluminum-water explosions.
- Dr. Simensen's theory requires that water react with molten aluminum from the aircrafts in order to produce the explosions he claims took place. However, according to NIST the sprinkler systems were not operational on the principal fire floors, given that the airplane impacts had severed the water pipes that carried water to the sprinkler systems.⁸³ The water

evidently flowed down the stairwells from the severed pipes, which theoretically could have produced explosions at the lower levels, since the molten aluminum could have also flowed down the buildings as well. But the fact of the matter is that the collapses did initiate at the floors where the planes hit, so it can at least be said that no such explosions could have contributed to the initiation of collapse. What further complicates this scenario is that according to NIST, the collapse of WTC1 initiated at the 98th floor.⁸⁴ However, this floor had far less debris (i.e. aluminum) on it compared to other floors below which were struck by much larger portions of the plane.⁸⁵

Despite these problems for Dr. Simensen's theory, he maintains that these were the explosions that "caused the uppermost floors of the buildings to fall and crush the lower parts" and that "these were the explosions that were heard by people in the vicinity and that have since given life to the conspiracy theories that explosives had been placed in the skyscrapers."⁸⁶ While we conclude that Dr. Simensen's theory is effectively groundless, we also note with interest that, in attempting to defend the idea that the Towers collapsed due to natural phenomena, Dr. Simensen has nonetheless acknowledged one aspect of the Towers' collapses that NIST and other detractors have consistently denied; that explosions equal in power to that of those produced by controlled demolition explosives contributed to the buildings' destruction. And if such explosions took place at the WTC, it follows that chemical analyses should have been carried out in order to determine their origin.

While further objections to the witness accounts may be expected, we maintain that the primary criticisms discussed so far have been effectively addressed. The witnesses' accounts of explosions from the Towers match well with the audiovisual recordings. They are corroborated by the reported aftereffects of the event, and there appears to be no prosaic explanation that can account for every aspect of what the witnesses heard and experienced that day. We thus conclude that 911myths.com's charge that "considerably more evidence" is needed to show that explosives were used has been answered.

4. World Trade Center 7

Thus far we have primarily looked at the question of explosions in regards to the collapse of the Twin Towers. We now turn our attention to the destruction of World Trade Center 7, where sound evidence of explosions also exists. Like their report on the Towers, the NIST investigation into the collapse of Building 7 has come under heavy scrutiny by several independent researchers.⁸⁷ However, as we have previously established, NIST does provide a far more technical analysis of the explosion issue within their WTC7 report than they had done for their report on the Towers. Yet we find that their reasoning against explosion sounds from WTC7 is just as fallacious as their reasoning in regards to the Towers.

4.1 Sound Levels

As discussed in Section 1, NIST identified 130 to 140 decibels as being the sound levels that would have been heard had explosives been used to bring down WTC7. Yet according to NIST, "There

were no witness reports of such a loud noise, nor was such a noise heard on audio tracks of video tapes that recorded the WTC 7 collapse.”⁸⁸ However, we have also explained that such a scenario is based solely on NIST’s predetermined conclusion that RDX would have been the primary explosive used. Rather, as we have already seen, the main materials demolition proponents believe were used are thermate and nanothermite, which can both be formulated to react without producing such explosive sounds. In addition to not testing for this material in the WTC debris, NIST also never simulated such a scenario either, as they deemed that it was “unlikely” that this material could have been placed inside Building 7 without detection.⁸⁹ Thus we see that NIST’s dismissal of a thermate/nanothermite demolition scenario is based not on scientific arguments, but rather an argument from incredulity; because *they* don’t believe such an event could have been done secretly, it therefore could not have happened.

4.2 Recordings and Witnesses

Another problem with NIST’s argument is that, by claiming that explosive sounds of “130 to 140 decibels” were not heard or recorded, it implies that no explosive sounds at all were heard from Building 7. However, this suggestion is demonstrably false. There were in fact several witnesses who reported hearing explosions from Building 7 as it collapsed. One of these individuals was first responder Craig Bartmer, who testified that:

I was real close to Building 7 when it fell down [...] That didn’t sound like just a building falling down to me [...] There’s a lot of eyewitness testimony down there of hearing explosions [...] I think I know an explosion when I hear it.⁹⁰

A New York University medical student working near Building 7 on 9/11 claimed that he and others “heard this sound that sounded like a clap of thunder” right before the building collapsed.⁹¹ NY1 reporter Gigi Woods described a “loud, incredibly loud explosion” as Building 7 collapsed.⁹² And first responder and former Air Force medic Kevin McPadden testified that right before Building 7 collapsed:

[I heard] explosions [...] we’re talking about bombs, because [it sounded like] “ba-bam!,” cause you know you get that like “ba-bam!” You know, there’s like a little explosion and then the force. And you could feel it coming through the ground. It was vibrating [...] You could feel the vibration move through things, cause it’s like a different wave that’s coming off of it. And then boom-boom-boom-boom-boom-boom-boom, that was the building coming down, not the explosions. So it was two distinct sounds that were happening.⁹³

Furthermore, there are recordings from 9/11 in which loud explosions can be heard (which were recorded after the Towers collapsed, but before Building 7 collapsed).⁹⁴ There is also at least one video of Building 7’s collapse in which a sharp explosive noise can be heard as it collapses.⁹⁵ And according to an analysis by physicist David Chandler, several booms can be heard in one video right before the building collapses.⁹⁶ Again, these sounds may not have been the 130 to 140 decibels claimed by NIST, but the idea that explosive sounds of any kind were neither heard nor recorded is clearly unfounded. But perhaps the most obvious indication of this is found in regards to the testimony of two men who were nearly killed by an explosion in Building 7.

4.3 Barry Jennings and Michael Hess

On the morning of 9/11, Barry Jennings, the deputy director of the Emergency Services Department of the New York City Housing Authority, and Michael Hess, New York City's corporation counsel, went to the 23rd floor of WTC7, which acted as New York City's Office of Emergency Management. Upon arriving at the OEM, both men found that it was empty due to being evacuated. When they exited the 23rd floor and started down the stairwell, they were trapped inside the building by an event that both men described as an explosion. Here are the accounts given by both men on 9/11 after they were rescued from the building.

[Barry Jennings] Well me and Mr. Hess the Corporation Counsel were on the 23rd floor. I told him we gotta get out of here. We started walking down the stairs. We made it to the 8th floor. * Big explosion! Blew us back into the 8th floor. And I turned to Hess and I said, "this is it! We're dead! We're not gonna make it outta here!" I took a fire extinguisher and I bust[ed] a window out. That's when this gentleman here heard my cries for help. This gentleman right here and he kept saying "stand by, somebody's coming to get you."⁹⁷

[Michael Hess] I was up in the Emergency Management Center on the 23rd floor. And when all the power went out in the building, another gentleman and I walked down to 8th floor * where there was an explosion. And we were trapped on the 8th floor with smoke, thick smoke all around us for about an hour and a half. But the New York fire department as terrific as they are just came and got us out.⁹⁸

*Note: The explosion actually took place on the 6th floor, and both men then made it back to the 8th floor. This was later clarified and confirmed by Barry Jennings and Michael Hess in subsequent interviews.

These accounts pose a serious problem for NIST's conclusion that no explosions took place within WTC7. Granted, this event clearly took place long before the building collapsed, and therefore has little bearing on the issue of the initiation of the building's collapse. However, in this case the focus should be directed towards the event itself, not the potential purpose of said event. It is possible that this explosion played some role in the destruction of Building 7, but an investigation into the cause of the explosion is what would ultimately tell us if that were the case.

Despite the implications of Hess and Jennings' testimonies, NIST has subsequently attempted to explain away this event by arguing that what they experienced was not an explosion at all. NIST's claim, which has since been endorsed and repeated by defenders of the official story, is that the explosion the two men experienced was actually the result of falling debris from the collapse of the North Tower that struck WTC7. As NIST writes in their report:

Two New York City employees had gone to the OEM Center on the 23rd floor and found no one there. As they went to get into an elevator to go downstairs, the lights inside WTC 7 flickered as WTC 2 collapsed. At that point, the elevator they were attempting to catch no longer worked, so they started down the staircase. When they got to the 6th floor, WTC 1 [the North Tower] collapsed, the lights went out in the staircase, the sprinklers (at an unspecified location) came on briefly, and the staircase filled with smoke and debris. The two men went back to the 8th floor, broke out two windows, and called for help. Fire fighters on the ground saw them and went up the stairs.⁹⁹

Before critically examining NIST's claims about this event, we first note that Michael Hess has since retracted his testimony from 9/11, now more or less agreeing with NIST's version of events. In an interview given to the BBC, Hess now claims that the event he and Jennings experienced

was in fact just the collapse of the North Tower and that there were no explosions.¹⁰⁰ However, since his interview on 9/11, Barry Jennings has also been interviewed by both the BBC and the *Loose Change* crew, and in both interviews he repeated his assertion that the event he experienced was indeed an explosion.¹⁰¹ Though Hess and Jennings' testimonies now contradict each other, by examining their testimonies and the events of that day further, we can reasonably establish that Jennings' testimony is in all likelihood correct. There are at least two primary reasons why the event described by these men could not possibly have been the result of debris from the North Tower's collapse striking WTC7.

First, Hess and Jennings were almost certainly trapped in the building before the North Tower collapsed. According to Hess's first testimony, he and Jennings were trapped in the building "for about an hour and a half." The interview Hess gave on 9/11 was given at 11:57am,¹⁰² and the North Tower collapsed at 10:28am. According to the reporter who interviewed Hess, the interview was given "off Broadway by City Hall," which is several blocks from WTC7. Therefore, it is likely that Hess and Jennings were trapped at around 10:00am.

That is, if they were trapped at 10:00am, and were rescued "an hour and a half" later, they would have gotten out of the building at around 11:30am. An 11:30 rescue time is, furthermore, corroborated by the fact that, according to firefighter John Spiech, he and others entered Building 7 at around 11:00am, and rescued Hess and Jennings shortly thereafter.¹⁰³ Exiting the building at around 11:30am would have given Hess just enough time to make his way across the city to give his interview at 11:57. Had they been trapped later than 10:00am, or just after the collapse of the North Tower at 10:28am, Hess would not have had time to give his interview over an hour and a half later. This point is very important, as NIST had claimed in one of its previous reports that these men were rescued from Building 7 somewhere between 12:10 and 12:15pm.¹⁰⁴ But if Hess had been interviewed at 11:57am, this renders NIST's timeline impossible. Also, Hess's estimate of being trapped for an hour and a half may have been somewhat conservative, as Jennings stated in his *Loose Change* interview that he and Hess were trapped "for several hours."

Second, the effects of the event described by Jennings could not possibly have been caused by debris from the North Tower striking the south side of WTC7. According to Jennings, he and Hess were on the north side of the building when the explosion occurred and trapped them on the stairwell. Jennings testified that "the explosion was beneath me," "the landing gave way," and that the explosion "blew us back." This raises the question of how *falling* debris from the North Tower, even considering it had collapsed at this time, could possibly have caused an *upward* explosive force strong enough to blow Hess and Jennings backwards and knock the landing out from under them. This also somehow had to be accomplished by debris striking the *south* face of WTC7 while both men were on the *north* side. NIST itself admits that "it is likely that the structural damage (steel and floor slabs) did not penetrate beyond the perimeter of the building core" and that "there was relatively little damage to the interior of WTC 7."¹⁰⁵

A video from 9/11 shows Michael Hess calling for help from a broken window on the northeastern face of WTC7,¹⁰⁶ which means he and Jennings would have been trapped on the stairwell located in the building's northeastern region. Yet according to NIST's own estimates,¹⁰⁷ the structural damage to WTC7 was nowhere near this location in the building.

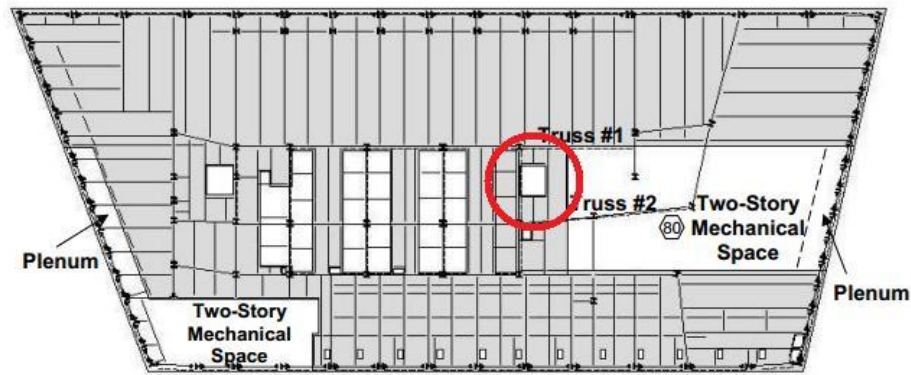


Figure L-12. Floor 6 plan.

Figure 6: Floor Plan of WTC7 Interior Frame (Appendix L of NIST-SP 1000-5, Fig. L-12. Note that the red circle has been added to highlight the northeastern stairwell.)

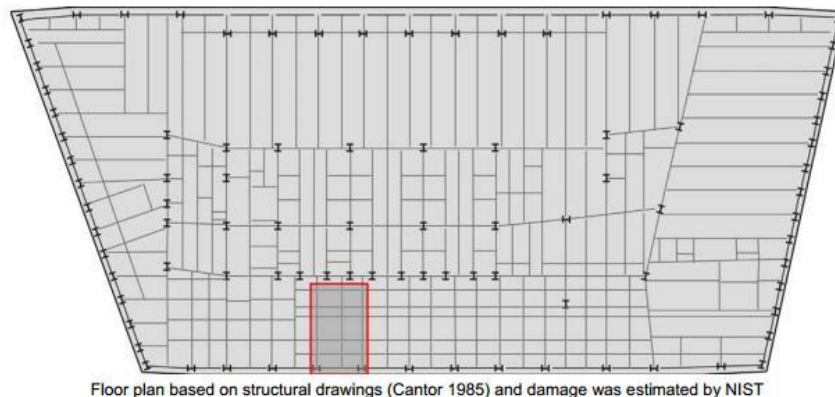


Figure 5-94 Estimated debris impact damage to Floors 5 and 6 of WTC 7.
Marked area indicates removed columns and floor segments.

Figure 7: Floor Plan of WTC7 Interior Frame (NIST NCSTAR 1-9, Fig. 5-94)

To summarize, if the explosion that Hess and Jennings experienced in Building 7 was caused by debris from the collapse of WTC1, then it must be adequately explained how a) Hess was able to be interviewed across town at 11:57am after being likely trapped before 10:28am, and b) how falling debris from WTC1 striking the south side of WTC7 caused an upward explosive force all the way on the north side of the building. Unless both of these issues are resolved, the testimony of Barry Jennings stands.¹⁰⁸ We have little reason to believe Michael Hess's new story, as it greatly contradicts Jennings' and his own original testimony. Not only does Hess now deny that the event that trapped them was an explosion, but when asked by the BBC if he heard other explosions in the building he flatly stated "no."¹⁰⁹ However, Jennings stated in his *Loose Change* interview that he heard "all types of explosions" while trapped in the building.

Based on this data, we conclude that NIST's explanation for the explosion Hess and Jennings experienced is totally unfounded. In fact, NIST's only other argument against the event being an explosion is, again, that the sound levels evidently weren't high enough. In response to the question of whether or not the event experienced by Hess and Jennings could have been an explosion, NIST replied:

The sound levels reported by all witnesses do not match the sound level of an explosion that would have been required to cause the collapse of the building.¹¹⁰

This of course completely misses the point of the question, which was to determine if explosions of any kind took place within WTC7, not the intended purpose of the explosions. Interestingly, in an earlier version of their FAQ page, NIST's answer was longer than this. In the 2010 version of this page, their answer to this question read as follows:

The sound levels reported by all witnesses do not match the sound level of an explosion that would have been required to cause the collapse of the building. If the two loud booms were due to explosions that were responsible for the collapse of WTC 7, the emergency responder-located somewhere between the 6th and 8th floors in WTC 7-would not have been able to survive the near immediate collapse and provide this witness account.¹¹¹

As we can see, NIST omitted the second part of this answer from the current version of their FAQ page, perhaps realizing that because the building obviously did not collapse at the time of the event, it is therefore absurd to argue their point based on the fact that Hess and Jennings weren't killed by the collapse. Yet we argue it is equally absurd to dismiss the event as an explosion simply because the sound levels weren't high enough to cause the building to collapse, because again, *the building did not collapse at the time of the event*. To argue in this way merely presupposes what the intent of the explosion would have been, which we argue NIST cannot possibly know if they don't investigate the event first. If NIST cannot identify a plausible prosaic explanation for what Hess and Jennings experienced, then it follows that the event would have been worthy of further investigation to identify the source and possible purpose of the event.

The author concludes that NIST's arguments against explosions from WTC7 are untenable. The arguments they have presented are based solely on their predetermined conclusions on what types of explosives would have been used and how they would have been set up. By creating their own straw-man version of events, NIST was able to dismiss every indication that explosives could have been used, including the audio recordings and witness testimonies that indicate explosions did indeed take place.

5. NIST's Distortions and Errors

Based on every point so far discussed, the author finds that NIST has ignored a multitude of evidence that shows that explosions took place at the WTC complex on 9/11, and because of this they have failed to adequately determine if explosives may have contributed to the destruction of the Twin Towers and Building 7. This is despite the fact that there were several *a priori* reasons to consider that explosives may have been used in the destruction of the WTC buildings, including:

- The fact that explosives had been previously planted in the WTC by terrorists in 1993.
- The fact that terrorists have been known to use "diversionary attack[s] and secondary device[s]" when committing acts of terrorism.¹¹²

- The fact that never before 9/11 had fire caused the total collapse of a steel-framed high-rise skyscraper.¹¹³
- The fact that before 9/11 the only process that had ever produced the complete destruction of a steel-framed high-rise skyscraper is controlled demolition with explosives.
- The fact that the collapse of all three buildings exhibited characteristics consistent with the use of explosives.
- The fact that no building that has collapsed from fire has ever produced every feature exhibited by the WTC buildings.¹¹⁴

NIST acknowledges that they never forensically tested the debris at Ground Zero for evidence of explosives. They never investigated the possible use of incendiaries such as thermate and nanothermite. They have denied that the audio recordings and witness accounts indicate that explosions did indeed take place at the WTC. They have ignored the fact that every feature of the buildings' collapses is readily explained by the controlled demolition theory. And yet despite all of this, NIST still maintains that they "found no corroborating evidence for alternative hypotheses suggesting that the WTC towers were brought down by controlled demolition using explosives."¹¹⁵ Yet the author argues NIST has no basis for claiming this, as they cannot know whether or not explosives may have been used *if they never even check*.

Below is a list of the major errors and fallacies the author believes NIST has committed in their investigation in regards to whether explosives may have contributed to the destruction of the WTC buildings.

Table 1: Errors in NIST's Twin Towers/World Trade Center 7 Investigations

NIST Investigation	Error/Fallacy	Reason
<p>1. "[T]here was no evidence (collected by NIST or by the New York City Police Department, the Port Authority Police Department, or the Fire Department of New York) of any blast or explosions in the region below the impact and fire floors..."</p> <p>-NIST WTC FAQ</p>	<p>Failure to consider use of explosives based on witness testimonies.</p>	<p>Over 100 first responders testified to hearing explosions from the WTC on 9/11.</p>
<p>2. "People on the street would have heard 9lb of RDX go off a mile away in air..."</p> <p>-NIST NCSTAR 1-9</p>	<p>Identifies RDX as the primary explosive used.</p>	<p>Proponents of the demolition theory have seldom posited RDX as the primary explosive that would have been used.</p>

<p>3. “[T]he noise level at a distance of ½ mile would have been on the order of 130 dB to 140 dB...”</p> <p>-NIST NCSTAR 1-9</p>	<p>Identifies noise as key criteria for identifying use of explosives.</p>	<p>The sound of an explosion is deemed “not an essential element in the definition of an explosion” by the NFPA 921 Guide.</p>
<p>4. “130 dB to 140 dB” sound levels</p> <p>-NIST NCSTAR 1-9</p>	<p>Asserts only these sound levels would be produced by explosives used to destroy WTC7.</p>	<p>A demolition involving incendiaries would not produce such sounds.</p>
<p>5. “[F]ragments [from WTC1] were forcibly ejected and traveled distances up to hundreds of meters.”</p> <p>-NIST NCSTAR 1-9</p>	<p>Failure to consider this event as consistent with the use of explosives.</p>	<p>The NFPA 921 Guide identifies this type of “high-order damage” as consistent with explosions.</p>
<p>6. “NIST did not test for the presence of explosive residue...”</p> <p>-NIST Response to Request for Correction</p>	<p>Failure to forensically examine WTC debris for residues of explosives and/or incendiaries.</p>	<p>The NFPA 921 Guide states that “chemical analyses” should be carried out to detect the presence of explosives and/or incendiaries.</p>
<p>7. “NIST’s WTC 7 investigation did follow the core tenet of NFPA 921”</p> <p>-NIST WTC7 FAQ</p>	<p>Failure to follow numerous recommendations made by the NFPA 921 Guide.</p>	<p>Reasons given in points 3, 5, and 6.</p>
<p>8. “There were no witness reports of such a loud noise...”</p> <p>-NIST NCSTAR 1-9</p>	<p>Failure to consider witness reports of explosion sounds.</p>	<p>Several witnesses testified to hearing loud explosions right before and during WTC7’s collapse.</p>
<p>9. “[N]or was such a noise heard on audio tracks of video tapes that recorded the WTC 7 collapse.”</p> <p>-NIST NCSTAR 1-9</p>	<p>Failure to consider explosion sounds heard in audio recordings.</p>	<p>Several audio recordings of WTC7’s collapse contain sounds of explosions.</p>
<p>10. “Two New York City employees had gone to the OEM Center on the 23rd floor... When they got to the 6th floor, WTC 1 collapsed, the lights went out in the staircase, the sprinklers... came on briefly, and the staircase filled with smoke and debris.”</p> <p>-NIST NCSTAR 1-9</p>	<p>Inadequate explanation for the event described by these men as an explosion.</p>	<p>Neither the timeline of events nor the effects of the event match NIST’s explanation.</p>

6. Conclusions

For years NIST and other detractors have argued that there exists no credible evidence for controlled demolition of the three WTC buildings on 9/11, including the evidence for sounds of explosions. We conclude in this paper that such a charge has been effectively answered and shown to be groundless. We have shown that such evidence has been found amongst the vast body of data regarding the WTC buildings' destruction, and that the official investigators have failed to adequately consider it. It is for these reasons that the author calls for a new investigation into the destruction of the Twin Towers and World Trade Center 7 in order to fully understand what truly caused their destruction that tragic day.

About the Author

The author of this paper, Adam Taylor, has been actively researching the events of 9/11 since 2007. He is a former contributing writer for the site *Debunking the Debunkers of the 9/11 Truth Movement* (<http://911debunkers.blogspot.com/>).

He has also worked as a contributing writer and researcher for <http://www.ae911truth.org/> and <http://www.scientificmethod911.org/>. He is the author of the AE911Truth multi-part essay "Debunking the REAL 9/11 Myths: Why Popular Mechanics Can't Face Up to Reality," available at <https://www.ae911truth.org/evidence/technical-articles/articles-by-ae911truth/436-debunking-the-real-9-11-myths-series>.

See also his bio at http://www.scientificmethod911.org/authors/taylor_author.html.

*This paper has been updated and revised from the original, available at https://citizenfor911truth.files.wordpress.com/2014/09/adam_taylor_explosion_or_collapse1-1.pdf. Changes include: Extended Table of Contents, formatting changes, corrected typos, additional end notes added, updated inactive links in end notes, additional images added to Appendix A, superficial cleanup (all sections).

Appendix A. Core Column Damage

The following table provides examples of core column damage that the author deems indicative of explosives being used. Most of the images are cropped from larger photos in order to highlight the specific damage discussed in section 2.3. Images 1 through 10a, and 13 through 16 were taken from FEMA's Ground Zero photo archive.

http://www.fema.gov/photolibrary/bookmark_search.do?sDisasterNumber=1391

However, as of 11 February 2014, the webpage appears to have been deleted. Regardless, the author has archived the following cited photos, and a link to each unedited photo is provided to accompany each cropped image. Images 10b and 10c were taken from 911datasets.org (now defunct), which archives data released through FOIA requests to the International Center for 9/11 Studies.

<http://911datasets.org/index.php/SFolder:TFZWUA5UFIPUW3PQFOLXP5NS6Z6D76V3>

Image 11 is taken from a photo featured in Joel Meyerowitz's *Aftermath* (New York: Phaidon Press, 2006), p. 30.

Image 12 is from an archive of photos taken by Lane Johnson, but like the FEMA webpage, this site also appears to have been deleted.

<http://www.amny.com/entertainment/news/am-wtcrelics-pg2006,0,6613706.photogallery>

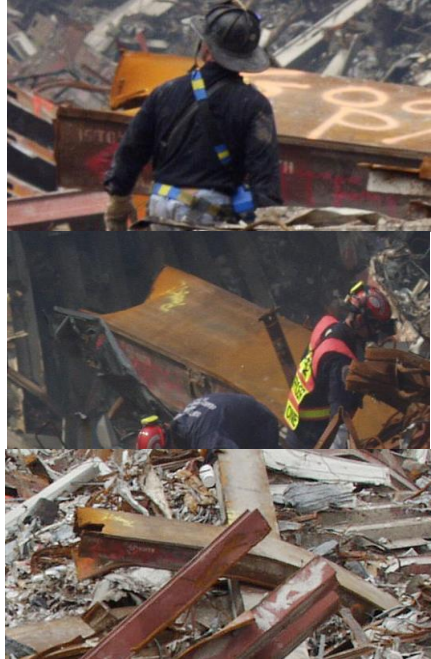
However, several of the photos, including the one cited below, have been archived at 911research.wtc7.net. A link to the complete unedited version of the photo is included in the table.






<http://911research.wtc7.net/wtc/evidence/photos/hanger17.html>





Images 17 and 18 are from a photo taken by Graham Morrison, featured in "In the Land of the Free: September 11, 2001 – 10 Years Later," *LIFE Books*, Vol. 11, No. 12, 2 September 2011, p. 80.





Table 2: Evidence of Core Columns Damaged by Explosives


Photo(s)	Source	Core Columns
1.	FEMA.gov Original: http://tinyurl.com/mutjobt	

<p>2a.</p> <p>2b.</p> <p>2c.</p>	<p>FEMA.gov</p> <p>Original: http://tinyurl.com/l7txroo http://tinyurl.com/nhr7x4m http://tinyurl.com/mutjobt</p>	
<p>3.</p>	<p>FEMA.gov</p> <p>Original: http://tinyurl.com/lrlpkms</p>	
<p>4.</p>	<p>FEMA.gov</p> <p>Original: http://tinyurl.com/mcv42o5</p>	
<p>5.</p>	<p>FEMA.gov</p> <p>Original: http://tinyurl.com/m7fwxwo</p>	

6.	FEMA.gov Original: http://tinyurl.com/orsggc9	
7.	FEMA.gov Original: http://tinyurl.com/orsggc9	
8.	FEMA.gov Original: http://tinyurl.com/lwkambg	
9.	FEMA.gov Original: http://tinyurl.com/l2fku84	
10a.	FEMA.gov Original: http://tinyurl.com/14h3qhc	

<p>10b.</p> <p>10c.</p>	<p>911datasets.org</p> <p>Original:</p> <p>http://tinyurl.com/lbxbqq5</p> <p>http://tinyurl.com/18bzyqf</p>	
<p>11.</p>	<p>Joel Meyerowitz, <i>Aftermath</i> (New York: Phaidon Press, 2006)</p>	
<p>12.</p>	<p>AMNY.com</p> <p>Original:</p> <p>http://tinyurl.com/mt36zd9</p>	
<p>13.</p>	<p>FEMA.gov</p> <p>Original:</p> <p>http://tinyurl.com/15h7rtq</p>	

14.	<p>FEMA.gov</p> <p>Original: http://tinyurl.com/orsggc9 </p>	
15.	<p>FEMA.gov</p> <p>Original: http://tinyurl.com/pfqa4bp </p>	
16.	<p>FEMA.gov</p> <p>Original: http://tinyurl.com/14h3qhc </p>	
17.	<p><i>LIFE Books</i>, Vol. 11, No. 12, 2 September 2011</p>	

<p>18.</p>	<p><i>LIFE Books</i>, Vol. 11, No. 12, 2 September 2011</p>			
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Notes

¹ NIST NCSTAR 1 at http://www.nist.gov/manuscript-publication-search.cfm?pub_id=909017.

² The literature detailing the flaws in the NIST WTC report is vast. However, the very best critiques of the report are as follows: Jim Hoffman, “Building a Better Mirage: NIST’s 3-Year \$20,000,000 Cover-Up of the Crime of the Century,” *9/11Research*, 8 December 2005 at <http://911research.wtc7.net/essays/nist/index.html>; Eric Douglas, “The NIST WTC Investigation--How Real Was The Simulation?,” *Journal of 9/11 Studies*, December 2006 at <http://www.journalof911studies.com/volume/200612/NIST-WTC-Investigation.pdf>; Jim Hoffman, “Review of ‘A New Standard For Deception: The NIST WTC Report’ A Presentation by Kevin Ryan,” 15 October 2006 at http://911research.wtc7.net/reviews/kevin_ryan/newstandard.html; Anonymous and F. Legge, “Falsifiability and the NIST WTC Report: A Study in Theoretical Adequacy,” *Journal of 9/11 Studies*, March 2010 at <http://www.journalof911studies.com/volume/2010/Falsifiability.pdf>; Andrea Dreger, “How NIST Avoided a Real Analysis of the Physical Evidence of WTC Steel,” *AE911Truth*, 23 August 2011 at <http://www1.ae911truth.org/en/faqs/547-how-nist-avoided-a-real-analysis-of-the-physical-evidence-of-wtc-steel.html> (full length version available at http://www1.ae911truth.org/documents/How_NIST_Avoided_a_Real_Analysis_of_the_Physical_Evidence_of_WTC_Steel.pdf).

³ These and other evidence are catalogued at <http://www.ae911truth.org>.

⁴ For refutations of arguments against the demolition theory, the website *Debunking the Debunkers* is highly recommended (<http://911debunkers.blogspot.com>).

⁵ Roberts shows these clips in a video titled “WTC Not A Demolition,” which can be viewed here: http://www.911myths.com/index.php/WTC_Not_A_Demolition. I have demonstrated that Roberts’ video contains a significant number of false claims and fallacious arguments. See Adam Taylor, “The World Trade Center WAS a Controlled Demolition,” *Debunking the Debunkers*, 8 March 2011 at http://911debunkers.blogspot.com/2011/03/world-trade-center-was-controlled_08.html.

⁶ Author anonymous, “Firefighter’s Interviews - Sounds of Explosives or Explosive Sounds in the Towers,” *Journal of Debunking 9/11 Conspiracy Theories*, Volume 1, Issue 2, p. 3. Archived at <https://web.archive.org/web/20120208110648/http://www.jod911.com/sounds.pdf>.

⁷ Mike Williams (webmaster), “Accounts of Explosions,” *911Myths* (n.d.) at http://www.911myths.com/html/accounts_of_explosions.html.

⁸ Questions and Answers about the NIST WTC Towers Investigation (Updated 15 November 2019) at http://www.nist.gov/el/disasterstudies/wtc/faqs_wtctowers.cfm.

⁹ Ibid., question 8.

¹⁰ See for example <http://www.youtube.com/watch?v=VZ1E2NP1-s8>.

¹¹ NIST NCSTAR 1-9, p. 357, at http://www.nist.gov/manuscript-publication-search.cfm?pub_id=861611.

¹² NFPA 921 *Guide for Fire and Explosion Investigations*, 2004 Edition, Section 1.2.1 (PDF p. 6). Archived at https://web.archive.org/web/20140720031104/http://www.sierragal.com/252_stuff/NFPA_921.pdf.

¹³ Ibid., Section 21.1.4 (PDF p. 149).

¹⁴ Ibid., Section 21.3.2 (PDF p. 151).

¹⁵ See David Chandler's analysis in his video "High Speed Massive Projectiles from the WTC on 9/11," available at <http://www.youtube.com/watch?v=eHnLlwqiu0A>.

¹⁶ Crockett Grabbe, "Direct Evidence for Explosions: Flying Projectiles and Widespread Impact Damage," *Journal of 9/11 Studies*, August 2007, pp. 4-5, at <http://www.journalof911studies.com/volume/200704/GrabbeExplosionsEvidence.pdf>.

¹⁷ NIST NCSTAR 1A, p. 16, at http://www.nist.gov/customcf/get_pdf.cfm?pub_id=861610.

¹⁸ NFPA 921, Section 21.15.2 (PDF p. 164).

¹⁹ "NIST did not test for the presence of explosive residue and such tests would not necessarily have been conclusive." Quoted from "Sept. 2007 Response to April 2007 RFC, from NIST," 27 September 2007, p. 4, available at <http://www.journalof911studies.com/volume/2007/NISTResponseToRequestForCorrectionGourleyEtal2.pdf>.

²⁰ Ibid. NIST also claimed this with regards to testing for thermite/thermate residues (to be discussed later in this paper); see Questions and Answers about the NIST WTC Towers Investigation, question 22. Interestingly, this assertion is contradicted by Materials Engineering, Inc: "When thermite reaction compounds are used to ignite a fire, they produce a characteristic burn pattern, and leave behind evidence. These compounds are rather unique in their chemical composition [...] While some of these elements are consumed in the fire, many are also left behind in the residue. [...] The results [of testing residues], coupled with visual evidence at the scene, provide **absolute certainty** that thermite reaction compounds were present, indicating the fire was deliberately set, and not of natural causes" (emphasis added). Quoted from "MEi Provides Assistance in Arson Investigations," *MEI Newsletter*, Spring 1996 at <https://www.materials-engr.com/ns96.html>.

²¹ NFPA 921, Section 1.3 (PDF p. 6).

²² Questions and Answers about the NIST WTC 7 Investigation (Updated 20 November 2019), question 16, available at http://www.nist.gov/el/disasterstudies/wtc/faqs_wtc7.cfm.

²³ "The Top September 11 Conspiracy Theories," *America.gov*, 5 May 2009, archived at <http://web.archive.org/web/20110323153132/http://www.america.gov/st/webchat-english/2009/May/20060828133846esnamfuaK0.2676355.html>. Comment on this article: John-Michael Talboo, "ALERT: US State Department Cannot Afford Professional Advice on WTC Destruction," *AE911Truth*, 3 December 2010 at <http://www1.ae911truth.org/en/news-section/414-articles/414-alert-us-state-department-cannot-afford-professional-advice-on-wtc-destruction.html>.

²⁴ "9/11 Debunked: Controlled Demolition Not Possible" at <http://www.youtube.com/watch?v=tacYjsS-g6k>.

²⁵ For example, one witness who heard the sounds produced as the Towers collapsed described them as "explosions," and was located on the News Corp. Building in Manhattan, which is nearly four miles away from the WTC complex (via Google Maps: <http://goo.gl/maps/wSHTu>). See: "Fox News 9/11 Coverage: 11:08 a.m. - 11:23 a.m." at <http://www.youtube.com/watch?v=uw7vaGYZKfk>.

²⁶ Jim Hoffman (webmaster), "Covert Demolition," *911Review*, last updated 18 December 2010, at <http://www.911review.com/means/demolition/covert.html>.

²⁷ "Interview with Stacey Loizeaux," *NOVA* (n.d.) at <http://www.pbs.org/wgbh/nova/kaboom/loizeaux.html>.

²⁸ Quoted from Jim Hoffman's presentation featured in the film "9/11 Guilt—The Proof is in Your Hands," which can be viewed here: <http://www.youtube.com/watch?v=dvOQre3CTyo>.

²⁹ Indeed, several witness accounts even support this:

“I saw it as it was happening, and it sounded as if you had a hundred of those [...] firecrackers and you lit ‘em all off at once. That’s what it sounded like, it sounded like the finale of the fourth of July over the east river.” [https://youtu.be/4_oPXTbzSss]

“All of a sudden it was like bang bang bang bang bang, like bullet shots. And then all of a sudden, three tremendous explosions. And everything started coming down.” [https://youtu.be/jpTcPCOWBwY]

“Anyway, with that I was listening, and there was an incredibly loud rumbling. [...] The roar became tremendous. [...] I thought there had been an explosion or a bomb that they had blown up there.” [http://graphics8.nytimes.com/packages/pdf/nyregion/20050812_WTC_GRAPHIC/9110205.PDF (p. 13)]

“We were in the process of getting some rigs moved when I turned, as I heard a tremendous roar, explosion, and saw that the first of the two towers was starting to come down. [...] When the dust started to settle, I headed back down towards the World Trade Center and I guess I came close to arriving at the corner of Vesey and West again where we started to hear the second roar. That was the north tower now coming down. I should say that people in the street and myself included thought that the roar was so loud that the explosive – bombs were going off inside the building. Obviously we were later proved wrong. [...] The sound it made. As I said I thought the terrorists planted explosives somewhere in the building. That’s how loud it was, crackling explosive, a wall.” [http://graphics8.nytimes.com/packages/pdf/nyregion/20050812_WTC_GRAPHIC/9110098.PDF (pp. 6, 7, 12)]

“You know, and I just heard like an explosion and then cracking type of noise, and then it sounded like a freight train, rumbling and picking up speed, and I remember I looked up, and I saw it coming down.” [http://graphics8.nytimes.com/packages/pdf/nyregion/20050812_WTC_GRAPHIC/9110386.PDF (p. 10)]

³⁰ Jim Hoffman (webmaster), “Continuous Explosions Leveled the Towers,” *911Review*, last updated 14 February 2015, at <http://www.911review.com/attack/wtc/explosions.html>.

³¹ Quoted from <http://www.internationalskeptics.com/forums/showpost.php?p=8437753&postcount=5908>.

³² C4 described at <http://www.eurenco.com/content/explosives/demolition-breaching/conventional/explosive-blocks/c4>.

³³ RDX described at: <https://www.denix.osd.mil/cmrmr/ecmr/rdx/thebasics>.

³⁴ For a detailed explanation of what thermite is and its different variations, see Adam Taylor, “FAQ #7: What is nanothermite? Could it have been used to demolish the Twin Towers and WTC 7?,” *AE911Truth* (n.d.) at <https://www.ae911truth.org/evidence/faqs/359-faq-6-what-is-nanothermite-could-it-have-been-used-to-demolish-the-twin-towers-and-wtc-7>. (Originally published 19 July 2012 at AE911Truth.org. Also posted at 911Blogger.com: <http://911blogger.com/news/2012-07-23/fq-8-what-nanothermite-could-it-have-been-used-demolish-wtc-skyscrapers>.)

³⁵ D. P. Grimmer, “Calculations on the Possible Use of Thermite to Melt Sections of the WTC Core Columns,” *Physics911*, June 2004 at <http://physics911.net/thermite>.

³⁶ Steven E. Jones, “Why Indeed Did the World Trade Center Buildings Completely Collapse?,” *Journal of 9/11 Studies*, September 2006, p. 6ff at http://www.journalof911studies.com/volume/200609/Why_Indeed_Did_the_WTC_Buildings_Completely_Collapse_Jones_Thermite_World_Trade_Center.pdf.

³⁷ Adam Taylor, “FAQ #10: Wouldn’t the planes slamming into the Twin Towers have disturbed the demolition devices?,” *AE911Truth* (n.d.) at <https://www.ae911truth.org/evidence/faqs/352-faq-9-wouldn-t-the-planes-slamming-into-the-twin-towers-have-disturbed-the-demolition-devices>. (Originally published 12 January 2012 at AE911Truth.org.)

³⁸ Although many of the components of thermite can also found in normal office buildings (such as aluminum, iron, oxygen, etc.), it is not possible that these materials in the Towers could have assembled themselves into a carefully formulated aluminothermic composite as a result of the fires or the buildings’ collapses. For a discussion of this, see: Jim Hoffman, “Thermitic Pyrotechnics in the WTC Made Simple: Three Points of Active Thermitic Material

Discovered in Dust from the 9/11 World Trade Center Catastrophe that Anyone Can Understand,” *911Research*, 26 April 2009 at http://www.911review.com/energeticmaterials09/911research/thermitics_made_simple.html.

³⁹ It’s worth noting that the NFPA 921 *Guide* specifically states that residues left by thermite should be tested for in an investigation (Section 18.4.5), which further highlights the absurdity of NIST’s unjustified decision not to test for explosive and/or incendiary material in the WTC debris.

⁴⁰ Eli Rika, “Popular Mechanics Ignores Its Own Historical Records of Thermite Demolition: Destruction of Skyride Towers, Reichstag Dome Set Incendiary Precedent,” *AE911Truth*, 4 November 2011 at <http://www.ae911truth.org/en/news-section/41-articles/575-popular-mechanics-ignores-its-own-historical-records-of-thermite-demolition-destruction-of-skyride-towers-reichstag-dome-set-incendiary-precedent.html>.

⁴¹ Jon Cole, “9/11 Experiments: The Great Thermate Debate,” 10 November 2010 at <http://911blogger.com/news/2010-11-10/911-experiments-great-thermate-debate>. Jon Cole’s experiments did show that when thermate is contained in a particular way, it does produce an explosive sound, but the sound levels are clearly not the 130 to 140 decibels asserted by NIST.

⁴² Kevin R. Ryan, “The Explosive Nature of Nanothermite,” *Physics911* (n.d.) at <http://physics911.net/the-explosive-nature-of-nanothermite>.

⁴³ Jim Hoffman (webmaster), “Aluminothermic Technology: Existence of High-Tech Metal-Based Explosives,” *911Research*, last updated 12 August 2009 at <http://911research.wtc7.net/wtc/analysis/theories/thermitetech.html>.

⁴⁴ Niels H. Harrit, Jeffrey Farrer, Steven E. Jones, Kevin R. Ryan, Frank M. Legge, Daniel Farnsworth, Gregg Roberts, James R. Gourley, and Bradley R. Larsen, “Active Thermitic Material Discovered in Dust from the 9/11 World Trade Center Catastrophe,” *The Open Chemical Physics Journal*, 2009, pp. 7-31 at <https://benthamopen.com/contents/pdf/T/OCPJ/TOCPJ-2-7.pdf>. Heading off attempts to discount this study is John-Michael Talboo and Ziggi Zugam, “9/11: Explosive Material in the WTC Dust” at <https://citizenfor911truth.files.wordpress.com/2016/02/911explosivematerialv1-3.pdf>.

⁴⁵ Andrzej W. Miziolek, “Nanoenergetics: An Emerging Technology Area of National Importance,” *The AMPTIAC Newsletter* 6.1, Spring 2002, pp. 43-44 (PDF pp. 4-5) at <https://www.darksideofgravity.com/nanosolgels.pdf>.

⁴⁶ Harrit *et. al.*, “Active Thermitic Material,” p. 26 (PDF p. 20).

⁴⁷ Andrey Bezmelnitsyn, Rajagopalan Thiruvengadathan, Syed Barizuddin, Daniel Tappmeyer, Steven Apperson, Keshab Gangopadhyay, Shubhra Gangopadhyay, Paul Redner, Mike Donadio, Deepak Kapoor, and Steven Nicolich, “Modified Nanoenergetic Composites with Tunable Combustion Characteristics for Propellant Applications,” *Propellants, Explosives, Pyrotechnics* 35.4, August 2010, pp. 384-394.

⁴⁸ A helpful video explaining this process can be viewed here: <https://www.youtube.com/watch?v=F5qipBVaM08>.

⁴⁹ For examples, see Jones, “Why Indeed Did the WTC Buildings Completely Collapse?,” p. 31; and Mike Rivero (webmaster), “Shaped Charges and the World Trade Center Collapses,” *What Really Happened* (n.d.) at http://whatreallyhappened.com/WRHARTICLES/wtc_charges.html.

⁵⁰ See a discussion of this issue at “Angled cut column explained,” at <http://911blogger.com/news/2008-10-11/angled-cut-column-explained>.

⁵¹ Jim Hoffman (webmaster), “Ground Zero Players,” *911Research*, last updated 21 March 2013 at <http://911research.wtc7.net/wtc/groundzero/players.html>.

⁵² Gordon Ross’s presentation can be viewed here: <https://www.youtube.com/watch?v=RZjOMkieVaw>.

⁵³ Jonathan Cole, Richard Gage, and Gregg Roberts, “FAQ #13: What is AE911Truth’s assessment of the directed energy weapon (DEW) hypothesis?,” *AE911Truth* (n.d.) at <https://www.ae911truth.org/evidence/faqs/353-faq-12-what-is-ae911truth-s-assessment-of-the-directed-energy-weapon-dew-hypothesis>. (Originally published 18 May 2014 at AE911Truth.org.)

⁵⁴ Field Manuel 5-250, *Explosives and Demolitions*, 5 June 1992, Chapter 3: “Calculation and Placement of Charges,” p. 3-1 (PDF p. 79) at [http://www.bits.de/NRANEU/others/amd-us-archive/fm5-250\(92\).pdf](http://www.bits.de/NRANEU/others/amd-us-archive/fm5-250(92).pdf).

⁵⁵ Gordon Ross, “How the Towers were Demolished” at <http://gordonssite.tripod.com/id2.html>.

⁵⁶ Quoted from: <http://911blogger.com/news/2008-10-11/angled-cut-column-explained#comment-199053>.

⁵⁷ Field Manuel 5-250, *Explosives and Demolitions*, p. 3-2 (PDF p. 80).

⁵⁸ Many of these accounts can be heard in the film “9/11 Revisited: Were Explosives Used?,” available to watch here: <https://www.youtube.com/watch?v=PWgSaBT9hNU>.

⁵⁹ Graeme MacQueen, “118 Witnesses: The Firefighters’ Testimony to Explosions in the Twin Towers,” *Journal of 9/11 Studies*, August 2006 at http://www.journalof911studies.com/articles/Article_5_118Witnesses_WorldTradeCenter.pdf.

⁶⁰ The multidimensionality of the witnesses’ accounts is explored by David Ray Griffin in his essay “Explosive Testimony: Revelations about the Twin Towers in the 9/11 Oral Histories,” *911Truth*, 18 January 2006 at: <http://www.911truth.org/explosive-testimony-revelations-twin-towers-in-911-oral-histories>.

⁶¹ In fact, videos of both the North and South Tower collapse do indeed seem to contain several distinct loud booms at the very beginning of each collapse. Examples: North Tower – <http://www.youtube.com/watch?v=4e6KTRh92wM>, South Tower – <http://www.youtube.com/watch?v=9fNLz8zWwAM>.

⁶² For example, Jim Hoffman has suggested that thermate was used to weaken the internal supports of the buildings, thereby allowing the upper sections to begin collapsing before the primary explosives were set off further down the structures. As he explains, “A key objective is get[ting] the top of the Tower to move before explosive action is clearly evident to onlookers outside the building.” This analysis is described in more detail in his essay “A Hypothetical Blasting Scenario: A Plausible Theory Explaining the Controlled Demolition of the Twin Towers Using Aluminothermic Incendiaries and Explosives with Wireless Detonation Means,” *911Research*, 9 April 2009 at http://911research.wtc7.net/essays/thermite/blasting_scenario.html. Similarly, mechanical engineer Tony Szamboti has proposed that the internal supports of the buildings were weakened first, and that doing so would match with what is seen in the visual record of the beginning of each collapse. See his analysis in “The Sustainability of the Controlled Demolition Hypothesis for the destruction of the Twin Towers,” *Journal of 9/11 Studies*, February 2008, pp. 5-6, at <http://www.journalof911studies.com/volume/200704/SzambotiSustainabilityofControlledDemolitionHypothesisForDestructionofTwinTowers.pdf>.

⁶³ MacQueen, “118 Witnesses,” p. 54 (PDF p. 8).

⁶⁴ Graeme MacQueen, “Eyewitness Evidence of Explosions in the Twin Towers,” published in *The 9/11 Toronto Report*, ed. James Gourley (International Center for 9/11 Studies, 2012), p. 177.

⁶⁵ These accounts can be heard in the film “9/11 Revisited,” at about the 5:25 minute mark.

⁶⁶ Author anonymous, “Firefighter’s Interviews,” p. 12.

⁶⁷ MacQueen, “Eyewitness Evidence of Explosions,” p. 178.

⁶⁸ Paul Lemos’s account can be heard in this video: https://www.youtube.com/watch?v=vJ6cJ_jGqLo.

⁶⁹ MacQueen, “Eyewitness Evidence of Explosions,” pp. 178-79.

⁷⁰ Susan Hagen and Mary Carouba, *Women at Ground Zero: Stories of Courage and Compassion* (Indianapolis, IN: Alpha, 2002), p. 65.

⁷¹ James T. Thurman, *Practical Bomb Scene Investigation*, 2nd ed. (New York: CRC Press, 2011), pp. 29, 33.

⁷² Hagen and Carouba, *Women at Ground Zero*, p. 65.

⁷³ Ibid.

⁷⁴ Ibid.

⁷⁵ Ibid., p. 69.

⁷⁶ Ibid.

⁷⁷ For accounts of other individuals who experienced these effects, see “The Destruction of Each World Trade Center Tower Generated A Hot Density Current,” archived at https://web.archive.org/web/20151129153818/http://911encyclopedia.com/wiki/index.php/The_Destruction_Of_Each_World_Trade_Center_Tower_Generated_A_Hot_Density_Current.

⁷⁸ “World Trade Center Task Force Interview: Firefighter Edward Cachia,” File No. 9110251, p. 5, at http://graphics8.nytimes.com/packages/pdf/nyregion/20050812_WTC_GRAPHIC/9110251.PDF.

⁷⁹ “World Trade Center Task Force Interview: Firefighter Timothy Hoppey,” File No. 9110229, p. 5, at http://graphics8.nytimes.com/packages/pdf/nyregion/20050812_WTC_GRAPHIC/9110229.PDF.

⁸⁰ “World Trade Center Task Force Interview: Firefighter William Reynolds,” File No. 9110288, pp. 3-4, at http://graphics8.nytimes.com/packages/pdf/nyregion/20050812_WTC_GRAPHIC/9110288.PDF.

⁸¹ Staff Reporter, “A NEW theory has emerged claiming to give the REAL reason the Twin Towers fell after the 9/11 attacks,” *The Sun*, September 2011, reproduced at <http://911blogger.com/news/2011-09-21/new-theory-has-emerged-claiming-give-real-reason-twin-towers-collapsed>.

⁸² Alex W. Lowery, “Safety coatings reduce risk of molten aluminium explosions,” *Aluminium Times* 11.3, July/August 2009, p. 61.

⁸³ NIST NCSTAR 1, p. 187.

⁸⁴ Ibid., p. 87.

⁸⁵ See Table 7-5 in NIST NCSTAR 1-2, p. 212, at http://www.nist.gov/manuscript-publication-search.cfm?pub_id=101012.

⁸⁶ Reporter, “A NEW theory has emerged.”

⁸⁷ For discussions of the flaws in the NIST WTC7 Report, the following articles are recommended: Kevin Ryan, “The NIST WTC 7 Report: Bush Science reaches its peak,” *911Review*, 10 September 2008 at http://911review.com/articles/ryan/NIST_WTC7.html; F. R. Greening, “Comments on the Draft Report NIST NCSTAR 1-9: ‘*Structural Fire Response and Probable Collapse Sequence of World Trade Center Building 7*’, issued by NIST August 21st, 2008,” 11 September 2008 at <https://citizenfor911truth.files.wordpress.com/2015/09/greeningcommentsscstar1-9.pdf>; Ronald Brookman, “The NIST Analyses: A Close Look at WTC 7,” *AE911Truth*, March 2010 at https://www.ae911truth.org/images/The_NIST_Analyses_-_A_Close_Look_at_WTC_7.pdf; Chris Sarns, “Fraud Exposed in NIST WTC 7 Reports,” *AE911Truth*, 14 December 2016 at <https://www.ae911truth.org/evidence/technical-articles/articles-by-ae911truth/317-fraud-exposed-in-nist-wtc-7-reports-series>.

⁸⁸ NIST NCSTAR 1-9, p. 357.

⁸⁹ Questions and Answers about the NIST WTC 7 Investigation (Updated 20 November 2019), question 14.

⁹⁰ “WTC Building 7 Explosions First Responder Craig Bartmer Interview” at <http://www.youtube.com/watch?v=-IfgYhjQ9fE>.

⁹¹ “WTC7 eyewitness 2 PFC” at <http://www.youtube.com/watch?v=zkuQtPzNEA>.

⁹² “NY1’s Gigi Stone Woods on WTC 7: ‘Incredibly Loud Explosion’” at <https://www.youtube.com/watch?v=NQEh7ApzKHM>.

⁹³ “Alex Jones interviews Kevin McPadden,” available at <https://www.youtube.com/watch?v=nKY0bIFyNms>.

⁹⁴ “World Trade Center on 9/11 - Sounds of Explosions” at http://www.youtube.com/watch?v=_A9X_8fIGeM.

⁹⁵ “WTC7 collapse (rare video)” at <http://www.youtube.com/watch?v=SIbqaybkbWI>.

⁹⁶ David Chandler, “WTC 7: Sound Evidence for Explosions” at http://www.youtube.com/watch?v=ERhoNYj9_fg.

⁹⁷ “Raw Footage of Barry Jennings Interview” at <http://www.youtube.com/watch?v=-XOK-r80nr8>.

⁹⁸ “Michael Hess, WTC7 explosion witness” at <http://www.youtube.com/watch?v=BUfiLbXMa64>.

⁹⁹ NIST NCSTAR 1-9, p. 298.

¹⁰⁰ Mike Rudin, “Caught up in a conspiracy theory,” *BBC News*, October 2008 at http://www.bbc.co.uk/blogs/theeditors/2008/10/caught_up_in_a_conspiracy_theo.html.

¹⁰¹ For Jennings’ interview with the BBC, see “WTC 7 - BBC The Third Tower - Conspiracy Files,” available at: <http://www.youtube.com/watch?v=vZbMfTtHkYM>. Jennings’ interview is unfortunately not uncut, and is split up into multiple segments throughout the video. However, every segment featuring Jennings can be seen at the following timestamps in the video: 0:42, 9:22, 12:01, 13:43, 18:27, 47:00, and 47:30. For Jennings’ interview with the *Loose Change* crew, see “Barry Jennings Uncut,” available at <https://www.youtube.com/watch?v=9e6rYzcAjog>. Also, the transcript of Jennings’ full interview to the *Loose Change* crew can be read here: <http://s1.zetaboards.com/LooseChangeForums/single/?p=108750&t=451652>.

¹⁰² David Ray Griffin, “Michael Hess, Barry Jennings: The 9/11 Interview with Evidence that NIST Lied about When Michael Hess and Barry Jennings Were Rescued,” *WanttoKnow.info* (n.d.) at <http://www.wanttoknow.info/008/hessjenningswtc7explosiontvbroadcast>.

¹⁰³ Case 11-4403, Document 68-1, 14 February 2012 – “In The Matter Of: In re: September 11 Property Damage and Business Loss Litigation – John S. Spiech, May 27, 2009,” p. JA-945 (PDF p. 112). Available at <https://911docs.files.wordpress.com/2021/01/volume-4-868-1161.pdf>.

¹⁰⁴ “Interim Report on WTC 7,” which is Appendix L of NIST-SP 1000-5: June 2004: Progress Report on the Federal Building and Fire Safety Investigation of the World Trade Center, p. L-18 at http://www.nist.gov/customcf/get_pdf.cfm?pub_id=860567.

¹⁰⁵ NIST NCSTAR 1A, p. 16.

¹⁰⁶ “WTC 7 Burning” at <http://www.youtube.com/watch?v=ZduP7HTM3cg>.

¹⁰⁷ For a summary of NIST’s damage estimates for WTC7, see Section 5.5.3: Summary of Debris Damage to WTC 7 Based on Visual Data, in NIST NCSTAR 1-9, p. 182ff.

¹⁰⁸ For a more in-depth study of Hess and Jennings’ testimonies, see David Ray Griffin, *The Mysterious Collapse of World Trade Center 7: Why the Final Official Report about 9/11 is Unscientific and False* (Northampton, MA: Olive Branch Press, 2010), pp. 84-110.

¹⁰⁹ Hess states this at about the 1:50 minute mark of this video: <http://www.youtube.com/watch?v=hy5lpp6yADw>.

¹¹⁰ Questions and Answers about the NIST WTC 7 Investigation (Updated 20 November 2019), question 17.

¹¹¹ Questions and Answers about the NIST WTC 7 Investigation (09/17/2010, ARCHIVE, incorporated into 9/19/2011 update) at http://www.nist.gov/public_affairs/factsheet/wtc_qa_082108.cfm.

¹¹² This possibility was raised on 9/11 by New Mexico Tech explosive expert Van Romero, who suggested that the terrorists may have used the planes as a “diversionary attack” and then used explosives as “secondary device[s].” See Olivier Uyttebrouck, “Explosives Planted In Towers, N.M. Tech Expert Says,” *Albuquerque Journal*, 11 September 2001, archived at http://911research.wtc7.net/cache/disinfo/retractions/ABQjournal_Romero911.html. Romero has since retracted these claims regarding explosives (see John Fleck, “Fire, Not Extra Explosives, Doomed Buildings, Expert Says,” *Albuquerque Journal*, 21 September 2001 at <http://www.maebrussell.com/Articles%20and%20Notes/WTC%20Explosives.html>). Yet his original point remains a good one. Explosives *could* have been used in conjunction with the planes, especially considering that explosives had previously been planted in the WTC by terrorists in 1993.

¹¹³ Chris Sarns, “A Record of Major High-Rise Fires Worldwide,” *AE911Truth*, 10 March 2020 at <https://www.ae911truth.org/evidence/technical-articles/articles-by-ae911truth/648-a-record-of-major-high-rise-fires-worldwide>.

¹¹⁴ Adam Taylor, “Other Collapses in Perspective: An Examination of Steel Structures Collapsing due to Fire and their Relation to the WTC,” *Scientific Method 9/11*, April 2013 at http://www.scientificmethod911.org/reviewpages/taylor_other_collapses.html.

¹¹⁵ Questions and Answers about the NIST WTC Towers Investigation (Updated 15 November 2019), question 8.

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