

Text for slide presentation:

The Twin Towers' Demolition

by Jim Hoffman

EDITOR'S NOTE: This is a corrected version of an [earlier transcript](#), a typo in which was used by Michael Shermer to attack 911Research in a [column in Scientific American](#).

[SLIDE] This talk is on the Twin Towers demolition. The tower collapses were the most deadly, traumatic events of the September 11th attack. If the collapses were caused by demolition, then the official story collapses. Demolition, unlike so many other aspects of the attack, is an all-or-nothing proposition -- there's no plausible deniability -- either the towers were demolished or they weren't.

[SLIDE] Here's an outline of the rest of the talk. I'll first go through the official narrative of events, then I will examine the problems with it, culminating in several proofs of demolition.

[SLIDE] Here's the narrative of the events of September 11th. Without running through these, I just want to point out that we have a series of events, each of which is more improbable and shocking than the last.

The building demolitions didn't occur until over an hour into this series of horrors, so people were psychologically numbed to the implausibility of the official story that these towers, which in fact looked like they were blowing up, simply collapsed.

[SLIDE] What's wrong with the official story? Well, let's start with the fact that no steel-frame building in history has ever totally collapsed due to any set of causes other than demolition and severe earthquakes.

[SLIDE] There have been numerous examples of severe fires that have ravaged skyscrapers, gutting several floors, burning for numerous hours, and these fires didn't produce collapses; they didn't even damage the vertical columns of these buildings. Examples are the One Meridian Plaza fire in Philadelphia and the First Interstate Bank fire in Los Angeles.

These fires were far worse than those in either of the Twin Towers or Building 7 -- the 3 skyscrapers that collapsed in New York City on 9/11.

[SLIDE] So given that, it's clear that the collapse of these 3 skyscrapers, based on the official explanation, were the largest and most mysterious engineering failures in the history of the world.

Certainly the site should have warranted the most careful and painstaking investigation.

However FEMA, the Federal Emergency Management Agency, was entrusted with the responsibility of investigating the collapses even though it's not an investigative agency.

No investigation was funded. FEMA instead assembled a group of volunteer investigators, the so-called Building Performance Assessment Team, BPAT. These investigators were not allowed access to Ground Zero. They were only allowed to examine a few large pieces of steel that made it to Fresh Kills landfill, while the rest of it was being shipped to blast furnaces overseas. They had to guess where these pieces came from. By the time they finished their report, Ground Zero had been scrubbed, and there was no more evidence left.

The report was inconclusive. They pretend to explain the collapse of the North Tower, don't even consider the South Tower in detail, and admit they are clueless about what caused Building 7 to collapse.

[SLIDE] While this investigation was going on, the evidence was being destroyed as rapidly as possible. The evidence is the structural steel -- that's what holds the buildings up; that's what you would look at to try to understand what caused these buildings to collapse.

However the city accepted a plan by Controlled Demolition Inc. to recycle the steel, a mere 11 days after the attack. The steel was sold for a low price to scrap metal vendors who were soon whisking it onto ships bound for blast furnaces in India and China. New infrastructure in the form of docks was created to expedite this removal.

Investigators were barred from Ground Zero. People were threatened with arrest for merely taking photographs of Ground Zero. And this evidence destruction operation was conducted over the concerted objections of family members of the victims, and respected members of the public safety community such as Bill Manning of *Fire Engineering Magazine*, who published a blistering attack on it.

[SLIDE] Starting the day of the attack, a series of explanations was promoted to explain the collapses.

By the way this talk will be on the web It will have links to my website. I have a whole taxonomy of collapse theories.

[SLIDE] The theory promoted on the day of the attack I call the "Killer Fires" or "core meltdown" theory, in which we are told that the fires were unimaginably hot infernos -- never mind that they were putting out black smoke and you couldn't even see flames for the most part.

And the BBC quoted structural engineer Chris Wise whose quote I'd like to read:

"It was the fire that killed the buildings. There is nothing on earth that could survive those temperatures with that amount of fuel burning. The columns would have melted, the floors would have melted, and eventually they would have collapsed one on top of each other."

[SLIDE] What's wrong with this? ... Well, the basic physics of fire temperatures. The melting point of steel is slightly below that of iron, which is 1535 Celsius. The highest temperature you can achieve by burning hydrocarbons in the atmosphere without pressurization or preheating of the air is around 825 Celsius, and that's when you have pre-mixed fuel and air -- the kind of blue flame you get with a gas stove. Diffuse flames of the type you have in building fires are far cooler than that, and oxygen-starved diffuse flames are far cooler still. Note that the the dark smoke, especially in the South Tower, indicate that those fires were oxygen starved; they were probably only a few hundred degrees Celsius.

[SLIDE] A more sophisticated theory that was presented within days of the attack, is the "column failure" theory, or as we call it, the "wet noodle" theory, in which the heat from the fires supposedly causes the columns, not to melt, but to lose most of their strength by softening because steel starts to soften long before it melts at high temperatures.

This was endorsed by the paper by Bazant and Zhou which was published a mere two days after the attack. Wow, these guys must be super-geniuses -- they had it all figured out two days after the attack. Their paper confidently proclaims:

"The structural resistance was found to be an order of magnitude less than necessary for survival."

I just find this article ridiculous. They pull numbers out of thin air. They clearly reveal their profound ignorance of structural engineering principles such as overdesign and margins of safety. And their report is self-described as simple and approximate, yet nobody else has even bothered, apparently, to do a quantitative analysis of the collapses. So I guess their report was just so brilliant that no more analysis was needed beyond their simple and approximate one.

The column failure theory was also endorsed by Silverstein, the owner, for his insurance claim.

[SLIDE] The column failure theory is unfortunately inapplicable because the temperatures were nowhere near hot enough for that scenario. It assumes that the columns on an entire floor were raised to around 800 degrees Celsius, but note that the fires didn't even cover a single floor of either tower.

None of the features of 700-degrees-plus-Celsius fires were observed, which are [that] the steel would glow red-hot, there would be extensive window breakage, bright emergent flames would be visible, and light smoke, not the black smoke that we saw, at least as time progressed, would have been evident.

Moreover, fires have never caused a column failure in any steel structure, because steel has a high thermal conductivity, which means you pour heat onto it, and it soaks it away -- the heat conducts very rapidly.

Corus Construction Corporation performed extensive tests in multiple countries in which they subjected steel-framed carparks, which were uninsulated, to prolonged hydrocarbon fueled fires, and the highest temperatures they recorded in any of the steel beams or columns was a mere 360 degrees Celsius. At that temperature, structural steel loses only about 1 percent of its strength.

[SLIDE] Now even if somehow those fires could have been as hot as Bazant and Zhou would like for their column failure theory, they still could not level the towers, because the towers had 287 columns which would all have to be weakened to the point of collapse at the same instant to cause the vertical telescoping that we saw in the North Tower or even the South Tower. Asymmetric damage doesn't produce such a symmetric result. Some of the columns would get hotter before others and the tower would topple; it wouldn't collapse into itself. Earthquakes are the only natural cause, so to speak, that can cause that kind of simultaneous damage.

[SLIDE] Now, given the clear incongruity of the conditions for the column failure theory with what was actually observed, a new theory was introduced called the "truss failure" theory. Since the floor diaphragms which spanned the distance between the core structures and the perimeter walls are supported by lightweight open trusses, and because one can't see those trusses from outside the building, one can imagine a scenario where they become very hot and sag and precipitate some chain reaction of failures.

This is the theory that would be presented to the American public in the form of popular science programs such as NOVA's "Why the Towers Fell."

FEMA would later endorse it in their Building Performance Study, that report I mentioned earlier.

[SLIDE] One of the primary spokespersons for the truss failure theory is materials science Professor Thomas Eagar, who championed it with helpful metaphors such a zippers and dominoes. He explains

the zipper theory:

"Once you started to get angle clips [his misnomer for the steel shelves that supported the ends of the trusses] to fail, it put extra load on other angle clips and then it unzipped around the building on that floor in a matter of seconds."

He suggests that the towers were designed only to survive a trashcan fire!

"If it had only occurred in one little corner such as a trashcan caught on fire you might have had to repair that corner, but the whole building wouldn't have come crashing down. The problem was it was such a widespread fire, and then you get this domino effect."

I guess he hasn't studied other building fires -- they were more than trashcan fires.

[\[SLIDE\]](#) Now, it's interesting to note the deceptive techniques used by NOVA and Eagar on its website.

This animation shows this chain reaction of collapsing trusses. This doesn't show you several things.

One, there were perpendicular trusses interwoven with the trusses that you see. That would have unified the entire structure and you couldn't have had this chain reaction of unzipping around the building.

Two, it implies that the floors merely rested on the trusses when in fact these trusses were bolted into the pans underlaying the floor slabs every few inches.

Secondly if you look at this cute little schematic here you'll see that the core, how interesting, is depicted as a series of horizontal slabs, not as the vertical columns. The spandrel plates that linked the perimeter columns are also omitted.

Finally we have the plane approaching the towers. One thing to notice is that the plane is the dimensions of a 747 relative to the tower, which is over twice the size of a 767; and note that horizontal ribs replace the actual vertical columns of the building.

Now all these things are almost like hypnotic suggestions that try to make you think *pancake*. Here we have horizontal slabs ... all the better for pancaking.

[\[SLIDE\]](#) Now FEMA, of course, later adopted the truss failure theory and gave it the official stamp of government legitimacy.

Notice that this illustration here, believe it or not, is actually in the FEMA report. It has all kinds of cute illustrations that make things look very simple and tidy. Like NOVA, FEMA uses a variety of deceptive techniques. They substitute the words "service core" for "core structure", to help the reader think that the buildings were flimsy:

"The service core [bla bla bla] service core [bla bla]"

They say the perimeter and core columns could self-destruct if the floor diaphragms collapsed:

"As the floors collapse this left tall freestanding portions of the exterior wall and possibly central core columns. As the unsupported height of these freestanding exterior wall elements increased, they buckled at the bolted column splice connections and also collapsed."

[SLIDE] This misrepresents the design of the buildings. These buildings were designed to withstand 140 mile per hour winds, in which case the floor diaphragms would help transfer lateral loads between the core structures and perimeter walls. Absent such loads, the structural functions of the floors were not in play. No, the perimeter structures and core structures were not free-standing. The perimeter columns were linked by horizontal spandrel plates, and the core structure was a highly cross-linked structure that was easily capable of supporting itself (and several times the weight of the entire building). FEMA's report pretends that the towers would instantly self-destruct if the floor fell away. The key deception is to misrepresent the core as flimsy. They show the core columns at about a third of their dimensions. They don't show the cross-bracing beams.

[SLIDE] Now note that these cores were extremely robust structures. They had 47 box columns each a yard wide, fabricated of steel 4 inches thick near their bases. They were abundantly cross-braced and anchored directly onto bedrock. They did not need the floor diaphragms for support.

The core structures could have survived in a hurricane force wind by themselves. They wouldn't have simply vanished if the floors collapsed.

[SLIDE] The truss failure theory is really just a diversion to avoid the glaring deficiencies of the column failure theory, but likewise it doesn't begin to explain total collapse.

Neither tower's fires covered an entire floor, which is what you need to get this theory to work. Eager's zipper scenario is impossible given the cross-trussing. The floors would have easily absorbed the impact of a falling floor above, especially when you have the crumpling of the trusses which would have softened the impact, since the floors were designed to support many times the weight of their rated loads.

Moreover some floors must have had large I-beams, otherwise the building's tube-within-a-tube design made no sense.

And finally the domino-effect collapse of the floors diaphragms would have left both the perimeter wall and cores standing -- the floors would have slid down the cores like records on a spindle.

[SLIDE] None of the official theories can explain total collapses of any kind.

If damage due to impacts and fires were sufficient to cause some kind of collapse, it would have caused the tops of the towers to topple like trees, leaving the structures below the impact zones standing.

[SLIDE] They are even less able to explain the features of the collapses revealed by the surviving photographic and video evidence. This evidence survived the cleanup operation because the people running the clean-up operation didn't have control over all the photographs and videos that people took on 9/11.

[SLIDE] Now lets look at these actual features.

First we have explosive ejections of dust and pieces. Thick dust clouds spewed from the towers in all directions at about 50 feet per second. Solid objects were thrown ahead of the dust cloud. That's a feature of explosive demolitions of structures. Some pieces of the perimeter were thrown laterally as far as 500 feet. Here's a gash in 3 World Financial Center, about 400 feet away from the North Tower, and it's several hundred feet up.

Energetic ejections of dust occurred well below the rapidly descending demolition wave in each tower. Squibs which you can see in animations show rapid ejections of high velocity gases, over 200 feet a

second. The aluminum cladding was blown 500 feet in all directions, littering surrounding buildings for considerable distances.

It wasn't as if the towers exploded in a single explosion. They exploded in what's called a smooth wave. They started exploding and the explosion continued; it sounded like a huge ocean wave roar.

[SLIDE] The tops of the towers mushroomed - They exploded into dust and this became larger and larger as it inexorably moved down the tower just consuming each of the towers.

Each of these mushrooming tops remained centered around the towers' vertical axes, and as they expanded to about 3 times each tower's diameter by 5 seconds and about 5 times their diameter by 10 seconds, so they were just huge by the time they reached the ground.

[SLIDE] Now note that, discounting demolition, the telescoping collapses mean that the towers would be collapsing through themselves following the path of most resistance. That's not the way matter behaves -- I mean even if the towers were made of tooth-picks or butter, anything, they wouldn't collapse through themselves; they would topple one way or the other. And yet you see this perfect dead-centered symmetry in both collapses, even in the South Tower which started to tip but then just became symmetric. That's exactly what controlled demolition seeks to achieve in order to minimize damage to adjacent structures.

[SLIDE] Each tower disappeared into a volcano-like cloud of dust. Huge dust clouds -- many times the size of each tower -- inexorably advanced down the streets. They were so dense that they picked up and carried people.

[SLIDE] Incredibly, all that was left at the base of the towers was piles of twisted metal. Virtually all of the non-metallic components and contents of the buildings were converted to fine, sub-100-micron powder. Nearly all the office contents were pulverized beyond recognition, and over 1000 bodies could not be identified even after a year of painstaking analysis with the most advanced DNA techniques because they had been, according to the medical examiner, vaporized. Now it takes hours to cremate a body with temperatures over 500 degrees Fahrenheit.

[SLIDE] The steel structure was shredded. It was as if the buildings were put through some giant shredding machine. The perimeter wall was chopped into small pieces. The core structures were virtually obliterated, leaving no pieces more than about 70 feet long. And the metal was broken apart at the welds. So many of the prefabricated sections of spandrel plates and perimeter column sections were ripped apart at the welds.

[SLIDE] Intense heat persisted in the bottoms of the rubble piles for months. The fires continued to burn for 100 days, despite being sprayed with water.

And when the rubble pile was finally cleared, pools of previously molten steel were discovered at the foundations. That means that temperatures of over 1535 degrees Celsius were sustained for long enough to melt large quantities of steel, which could not possibly have been produced by residual hydrocarbon fires. Normally you need a blast furnace to achieve that kind of heat.

[SLIDE] Finally the proofs of demolition.

The first two of these are just totally based on common sense. The second two require a little bit of physics, but they're still basically common sense.

[SLIDE] Now the first proof is that if you look at the way that the towers disintegrated you can see thick clouds of pulverized concrete being ejected within the first two seconds. That's when the relative

motion of the top of the tower to the intact portion was only a few feet per second.

Now how could that speed turn the concrete that constituted the floor slabs -- how could it pulverize the concrete? It takes a lot of energy to pulverize concrete. To convince yourself that that proves demolition, think of taking a concrete block and dropping it from two stories. What do you think would happen? I think it would break into a few pieces. Even if you dropped a concrete block from a thousand feet, what do you think would happen? I think it would break into a bunch of small pieces. Obviously it wouldn't convert it into powder. There was some source of energy that was thoroughly pulverizing these buildings before they even started to fall.

[SLIDE] Second, rubble falling through the towers encountered no more resistance than rubble falling through the air. How could this be? If you dropped an object from the top of the tower in a vacuum, (the rate of gravitational acceleration is 32 feet per second squared) it would take 9.2 seconds to reach the ground. When we watch the North Tower collapse we see that it took about 13 to 16 seconds for the rubble to reach the ground, either inside or outside the footprint of the building. So in other words you have the stuff that's falling freely through the air outside the profile of the building and the stuff that's falling through where the building was -- it's [all] falling at the same speed.

Now if air could slow down the fall of debris from 9.2 seconds to 14 seconds, say a 50% slowdown in the rate of fall because of air friction, how much more should the huge intact structures -- the thousand foot vertical structure of these buildings -- how much more should that have slowed down the fall of the rubble within the profile of the building? A hundred times? A thousand times? And yet it falls at about the same rate. Clearly, again, the building was being demolished ahead of the falling rubble.

[SLIDE] The third proof is one that I've published a paper on, and it's based on the expansion ratio of the pyroclastic cloud following the collapse of 1 World Trade Center, the North Tower. Now the part of the cloud that I'm talking about is this dense part down here, the pyroclastic part, the part that's like a volcano. This part up here is a lot of smoke.

So what I do is I compute an estimate of the volume of this cloud at 30 seconds by taking sample points ... I compute a cylinder, and then based on that I come up with an estimate that the volume was about 5 times the volume of the original building, modulo some mixing, so I reduce my estimate down to an expansion ratio of 3.4 times.

Now there is only one way that expansion could have occurred: through the input of huge amounts of heat energy. Normally when you have the demolition of a building there is not that much energy in the explosives, and the dust cloud is about the size of the original building.

Not so with the twin Towers -- the dust clouds were multiple times the sizes of the buildings, and the only way that expansion could have occurred is through the input of vast amounts of heat energy to convert water to steam and expand gases. How much heat energy was required? I calculate that at least 1.5 million kWh was required to produce the expansion of the dust cloud of the North Tower to the 30-second mark. That compares with the gravitational potential energy -- the supposed source of all the energy according to the official theory for all this destruction -- of only about 100,000 kilowatt-hours. So basically we have an over ten-fold energy imbalance just looking at the energy required to produce the dust cloud expansion. That doesn't even account for other energy sinks, such as the vast energy sink required to pulverize all that concrete.

[SLIDE] The final proof is a little subtle too, because it requires understanding the law of angular momentum. Here we see, if we look at the destruction of the South Tower, that the top first started to tip, but then, instead of continuing to tip more, it started to disintegrate and then even started to rotate in the opposite direction.

The law of the preservation of angular momentum says that if you have a solid object and it has an angular momentum, it will preserve that angular momentum unless acted on by a torque. However, what we see is that it doesn't preserve that angular momentum. Instead it stops rotating and starts rotating the other way. And yet the only torque would have been tending to make it rotate faster in the same direction.

So the only explanation is that virtually the entire top of the South Tower had been shattered before it even began to fall, and that's clearly impossible according to the official theory, in which the top is this piston that is supposedly hammering down and crushing the rest of the building.

Well, not so, if it's already to disintegrate before it's even started to fall. Gravity couldn't do that -- some other form of energy had to break up the tower before it started to fall.

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