

“Surfing” the Big Wave on 9/11

Analysis of a Large Perimeter Column Wall Section of the South Tower

By Wayne Coste, PE

On the morning of 9/11 approximately six seconds after the top block of the South Tower began a hinging movement to the east, that top portion of the South Tower was completely demolished by outwardly directed, energetic forces which many people (imprecisely) attribute to explosives. This top block of the South Tower was large and consisted of approximately 30 floors – nearly one-third of the height of the Tower. Approximately three seconds after the initial movement, the demolition of the lower part of the South Tower began in earnest. It began with a series of outward bursts of propellant – observed as the horizontal expansion of a cloud of dust and debris that was much lighter in color than the dark smoke from the fires in the burning tower.

This horizontal expansion began near the 80th floor approximately 3.25 seconds after the hinging movement began. Then the energetic demolition continued down the tower with the ejection of many exterior structural elements – some traveling for great distances.

While there are many objects to observe during the demolition process, some are more interesting than others. One of the most interesting objects is a large wall section that appears to span nearly the entire width of the Tower. From the movement of this wall section, it appears that there are two or three sections that are traveling in adjacent trajectories. The most prominent section consists of eight contiguous perimeter column sections that are seen “surfing” their way into oblivion. Because of the low resolution in most older YouTube videos, these features were thought to be core columns. However, in reviewing the more detailed versions [available through NIST’s FOIA Releases¹](#) they are clearly seen to be perimeter column sections with the horizontal connecting spandrel plates plainly visible.

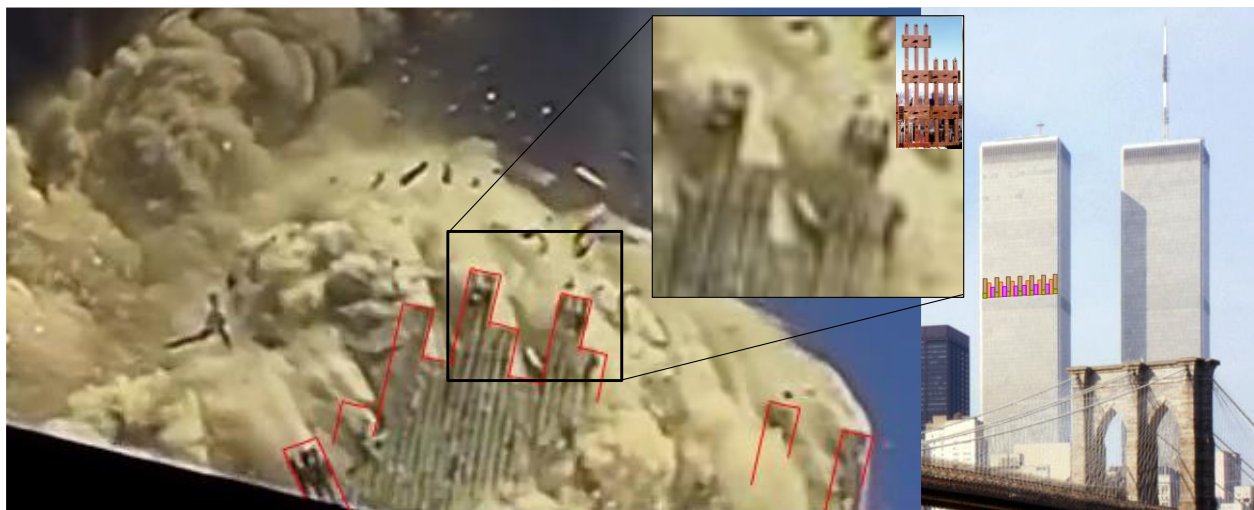


Figure 1: Eight or more contiguous perimeter column sections are seen propelled (left) from their initial location near the 80th floor (right). At this point, they have traveled over 200 feet from the South Tower wall.

¹ Source for many FOIA released videos, <https://www.youtube.com/user/WTCFOIAVideos>, (MrKoenig1985, Uploaded July 23, 2020)

Figure 1 (left) is a screenshot from the video known as, "[Skidmore, Owings & Merrill - from Dean Riviere²](#)," the shape of these perimeter columns with their connecting horizontal spandrels is clearly seen. By the time these columns emerge from the cloud of dust, debris and smoke they have been propelled nearly 200 feet away from the east face of the South Tower.

In the analysis discussed later, when these perimeter columns were first seen, they had been accelerated horizontally to a velocity of approximately 80 ft per sec (54 mph). The analysis shows that these perimeter columns originated from near the 80th floor (Figure 1, right) and had traveled approximately 2.27 seconds before they "out-ran" the cloud of propellant, fine dust and debris and emerged from the cloud. Additionally, the trajectory of these perimeter columns shows there was no initial component of velocity in the vertical direction (e.g., no initial velocity in the direction of gravity).

These steel perimeter columns emerged from the slower moving debris cloud because dust's low dispersed mass cannot travel as fast — or as far — in air when compared to denser pieces of steel, even though those smaller particles may have begun with higher initial velocities.

Figure 2 shows a portion of the east face of the South Tower, and identifies the configuration of the perimeter column sections. Their corresponding arrangement while "surfing" fits the design pattern.

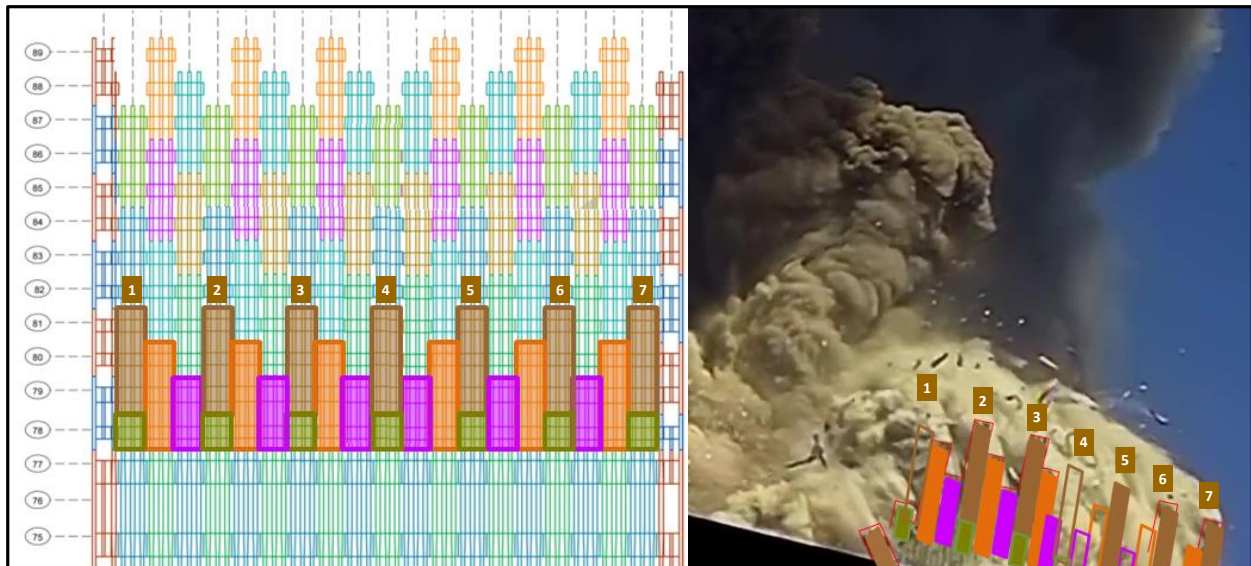


Figure 2: Initial location of expelled perimeter column sections in the east face of the South Tower (left) and estimated identification as they were propelled (right). Solid colors indicate columns that were observed in the video while outlined columns were not clearly seen.

These "surfing" perimeter columns were also captured in other photo and video records. A photo by Mark Stetler³ (Figure 3) provides an alternative view of the width of the ejected wall section. This perimeter column section can be seen to be a relatively coherent whole that extends for many floors.

² WTC Viewed from: Southeast with Camera Location: 14 Wall Street (25th floor, SOM NYC office), Manhattan, <https://youtu.be/ePcQzPN0Ls> (MrKoenig1985, Uploaded July 23, 2020), Videographer: Dean Riviere/Skidmore, Owings & Merrill (SOM) LLP

³ Schultz, Erin, North Fork Photographer Shares Unseen Images From 9/11, <https://patch.com/new-york/northfork/exclusive-north-fork-photographer-shares-unseen-image4c7f9df34a>, Sep 9, 2011



Figure 3: View of the “surfing” perimeter columns, taken nearly perpendicular to its trajectory, shows the width of the wall section which has been ejected as a relatively coherent whole.

Figure 4 shows these “surfing” perimeter columns from two perspectives that are approximately 90 degrees apart. Time-stamped photos in the Appendix to this paper show the movement of these perimeter columns from three perspectives (northeast, southeast and directly south).



Figure 4: Location of the “surfing” columns from the southeast (left) and the northeast (right) at 6.25 second after the hinging motion begins.

The horizontal forces observed dismembering the World Trade Center have a characteristic that suggests a unique form of destruction that is best described as “propelled demolition.”

This phrase, “propelled demolition,” is used to distinguish it from high-explosive based “controlled demolition” which destroys specific connections so that gravity can be harnessed to complete the demolition of the structure.

What Could Not Have Propelled These Perimeter Columns

This perimeter column wall section could not have been propelled into this trajectory by either high explosives or mechanical ejection.

- **High explosives** (e.g., “molecular explosives” as described – and distinguished from propellants – by Dr. Niels Harrit⁴) because the local damage from high explosives would have acted on small portions of the steel and could not have accelerated the entire perimeter column wall section as a (mostly) intact entity, or
- **Mechanical ejection** of these columns would not be possible because there was no mechanism to create the forces that would have been necessary to accelerate these perimeter columns to a horizontal velocity of 80 ft/sec (54 mph). As shown in Figure 5 any eastward mechanical ejection of the perimeter columns as a result of gravitational effects would also have imparted them with a significant initial downward velocity – which was not observed. In order for the observed perimeter column sections to travel as a mostly coherent whole in adjacent trajectories while remaining relatively intact, the ejecting forces would need to be uniform across the width of the Tower. A downward focused gravity-only collapse, as NIST implied happened once conditions for “...collapse initiation were reached and [a gravity driven] collapse became inevitable⁵,” cannot produce forces orthogonal to the effect of gravity.

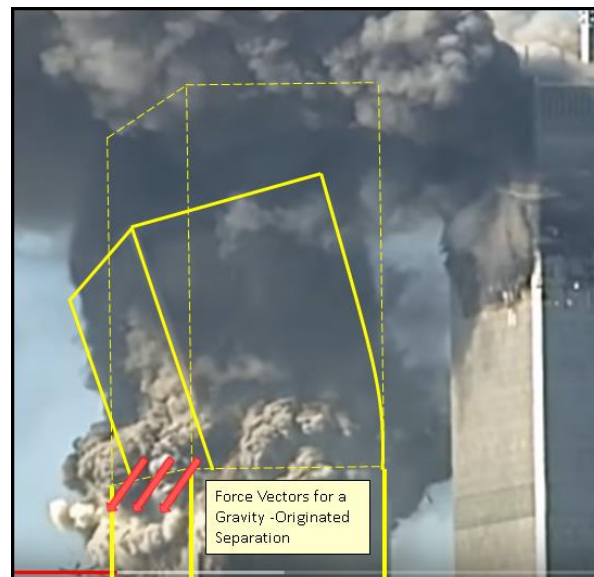


Figure 5: Any mechanical ejection due to gravity would impart an initial downward velocity component. None was observed.

⁴ "The Indisputable Forensic Evidence: The World Trade Center Buildings 1, 2 and 7, Niels Harrit - 9/11 Anniversary Conference - Zurich, Switzerland, Sept. 11, 2019, <https://www.youtube.com/watch?v=IMTCds1kuyM>

⁵ “The focus of the investigation was on the sequence of events from the instant of aircraft impact to the initiation of collapse for each tower....this sequence is referred to as the ‘probable collapse sequence,’ although it includes little analysis of the structural behavior of the tower after the conditions for collapse initiation were reached and collapse became inevitable,” NIST: Final Report of the National Construction Safety Team on the Collapses of the World Trade Center Towers (December 1, 2005).

Propelled Demolition

Because of NIST's abdication of an official explanation for the observed physical destruction of the Twin Towers, conjecture has focused on the use of "explosive detonations" as the cause. However, there is scant evidence in the audio record for the use of traditional high-explosives-based detonations (e.g., molecular explosives). Furthermore, the structural remnants – including steel beams, columns and connections – do not exhibit a widespread pattern of damage to support "explosive detonations" as a significant factor in the destruction of the Towers. In fact, any damage that *could be attributed* to high explosives is scarce to non-existent in the documented aftermath of the destruction.

A new paper, "[Investigating the Mechanics of Destruction at the Twin Towers on 9/11: The Case for Propelled Demolition](#)"⁶ proposes a method for the destruction of the Twin Towers that is in agreement with a weakness in the design of the Twin Towers, and aligns with key observations about its destruction.

For much of the destruction, the observations show highly energetic propelling forces that were activated floor-by-floor – with the origin of this force centered at the building's core / elevator shafts and radiating outward in the north-south and east-west directions. The observed propelling force is hypothesized to be based on a nano-thermite material that was "tuned" to be more like a rocket fuel propellant than either an explosive or an incendiary. This type of material would be more explosive than a propellant and not as explosive as "molecular" or high-explosives, according to Dr. Niels Harrit.

As described in the Propelled Demolition paper and shown in Figure 6, the activation of this propellant would create forces that would have traveled across the office areas from the core to the perimeter columns in a very fast, very high temperature thermal stream. This thermal stream would have been hot enough to contain molten iron which would later cool into the tiny iron spheres that characterized the World Trade Center dust. The effect of the passage of such an energetic stream on office contents would be to dissociate virtually everything encountered from human bodies to asbestos fireproofing. The propellant derived forces also would have accelerated the office furnishings and even floor truss components toward the perimeter column sections, creating immense simultaneous outward impact forces in all four directions, which the building was not designed to withstand. These forces would have resulted in the separation of the structure at its weakest point, which would have been the interior bolted connections between the floor trusses and the steel "channels" along the core.

⁶ Coste, Wayne, Investigating the Mechanics of Destruction at the Twin Towers on 9/11: The Case for Propelled Demolition, http://www.scientistsfor911truth.com/wp-content/uploads/2020/03/WTC_Propelled_Demolition_Paper.pdf, March, 2020

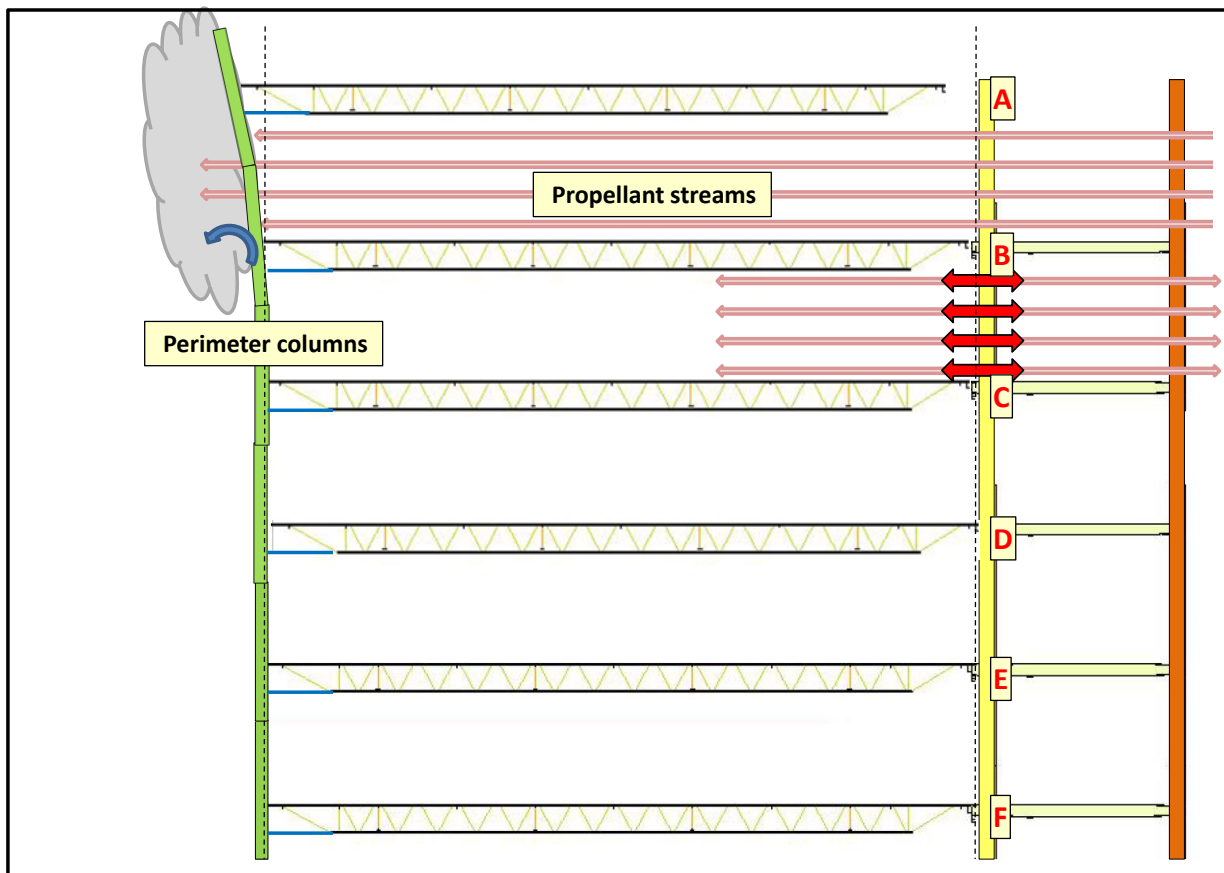


Figure 6: Propellant forces (pink), originating around the core, pushed groups of entire perimeter column sections (green) outward in a horizontal direction

As the floor truss to core connections failed under these horizontal forces which they were not designed to withstand, the outer perimeter wall sections were then propelled outward and peeled downward and outward through most of the height of the towers. As they fell, the remaining bolted connections failed. The activation of the propellant and the mechanical separations of bolted connections would have progressed down the structure at a relatively constant rate, optimized by the demolition planners using, and leveraging, gravitational forces.

“Surfing” Resulted from a Geometric Confluence

The “surfing” perimeter column wall section originated from the top of the stationary lower section of the South Tower, and not the bottom row of the hinging top block. This is because approximately four seconds after the hinging motion began, the east perimeter columns of the top block would have hinged inside the lower part of the South Tower. From this interior location, any propellant forces that were destroying the top block would also have been angled slightly downward and would have combined with the propellant forces directed horizontally at the wall section on the 80th floor (see Figure 7). This geometry-based confluence of propellant forces makes this location unique in the demolition of either Tower.

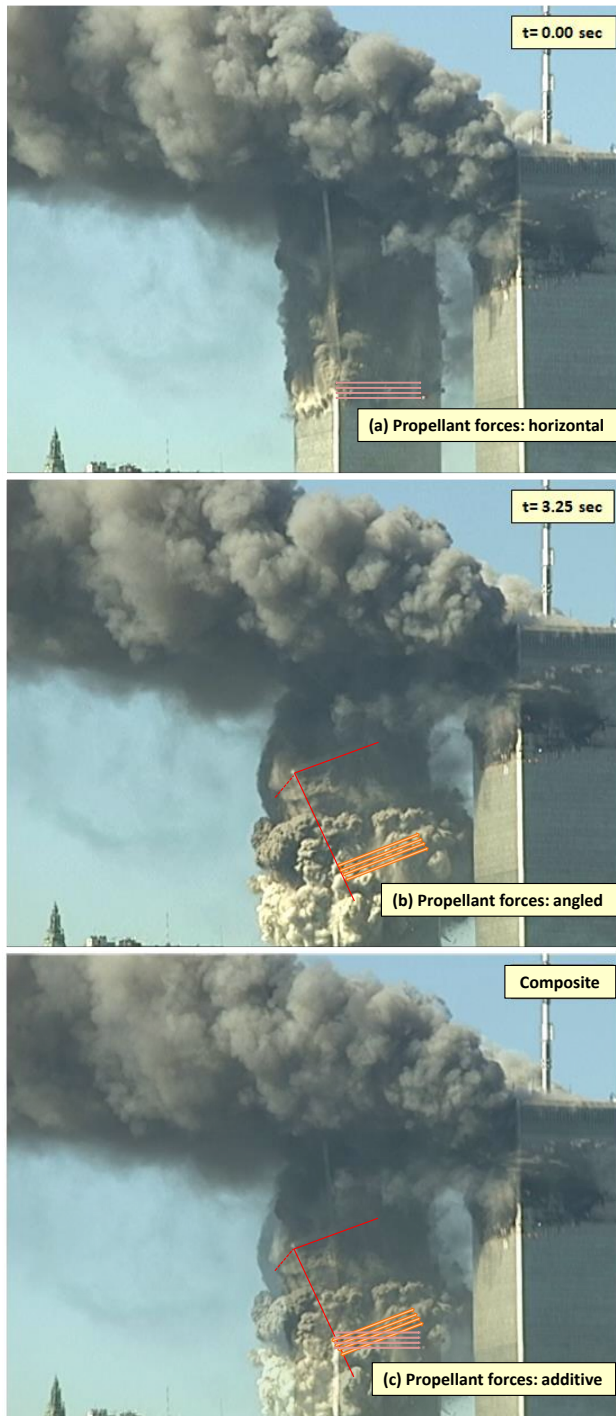


Figure 7: Horizontal forces from the stationary lower part of the Tower (a) and the forces from the angled top block (b) add together to create a propelling force that would have been much greater than at any other part of the Towers (c).

⁷ Coste, Wayne, The Case for Propelled Demolition

⁸ WTC2 Collapse: NE View by Onno DeJong, https://youtu.be/N_PKv6NX5VU (MrKoenig1985, Uploaded July 23, 2020)

⁹ Chandler, David, South Tower Smoking Guns, <https://youtu.be/DChR1XcYhlw>, Feb 12, 2010

¹⁰ Chandler, David, South Tower Smoking Guns (Follow-up), <https://youtu.be/cMX7qHGEOds>, Feb 12, 2010

¹¹ Coste, Wayne, The Case for Propelled Demolition

It is possible that a similar confluence of forces could have propelled a perimeter column wall section from the North Tower in a similar manner. However, as described in Section 3.5 of the [Propelled Demolition paper⁷](#), the hinging movement of the North Tower was less pronounced and the geometric addition of propelling forces may not have been sufficient to break the connections and accelerate a similar sized perimeter column wall section.

Analyzing the Trajectory

These “surfing” perimeter columns were recorded by several stable video cameras from various directions. Onno DeJong recorded a video that captured the movement of these perimeter columns from a location at 1st Avenue & 9th Street, “[WTC2 'Collapse' - Onno deJong⁸](#)” The quality of this video allows quantification of their movement with a reasonable degree of accuracy. The perimeter columns are clearly seen trailing white smoke behind them as they emerge from the cloud of debris and propellant. The trailing white smoke is consistent with the continued reaction of a nano-thermite based propellant. Similar propelled objects seen trailing white smoke had been previously described by David Chandler in [South Tower Smoking Guns⁹](#) and [South Tower Smoking Guns \(Follow-up\)¹⁰](#). It appears that some still-reacting propellant then impacted and adhered to the inside of the perimeter columns where it continued to react. Additionally, the top of these columns is tilted forward which is consistent with the hypothesized “banana peeling” mechanism described in Section 2.2 of the [Propelled Demolition paper¹¹](#) for perimeter columns originating at, and beneath, the point of initiation.

From the motion of the wall section in the DeJong video, the velocities and accelerations of these perimeter columns can be estimated. Figure 8 through Figure 12 show the location of these perimeter columns over the 1.33 seconds where they are visible in the DeJong video. The horizontal velocity is constant while the vertical velocity is accelerating.

Quantifying exact three-dimensional positions and velocities from a video at a single location is not possible – but relative positions, velocities and accelerations can be estimated.

The location of the top of these perimeter columns is first seen in Figure 8 as denoted by the round circle. Figure 9 shows the location 1/3 of a second later. Figure 10 shows continued constant horizontal motion while acceleration due to gravity is observed in the vertical direction. Figure 11 and Figure 12 illustrate the continuation of these horizontal and vertical movement trends.



Figure 8: First observed location of the perimeter wall section

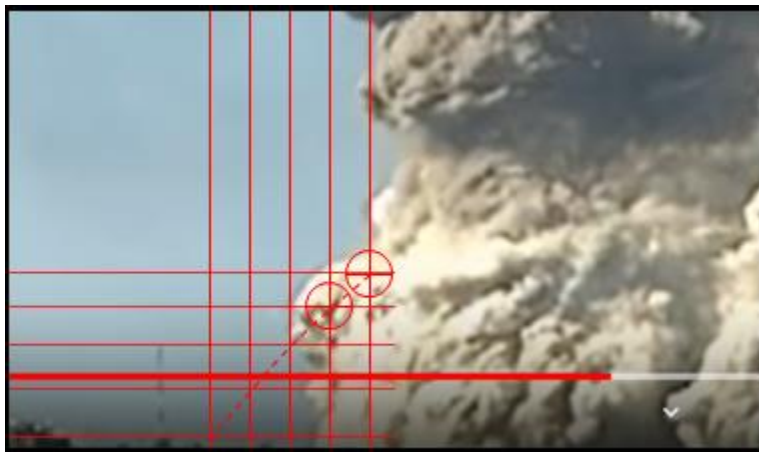


Figure 9: Location of the perimeter wall section after 0.33 sec

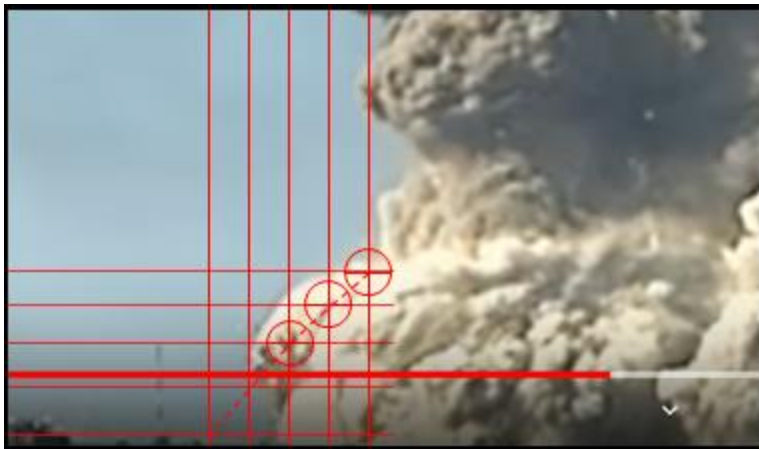


Figure 10: Location of the perimeter wall section after 0.67 sec

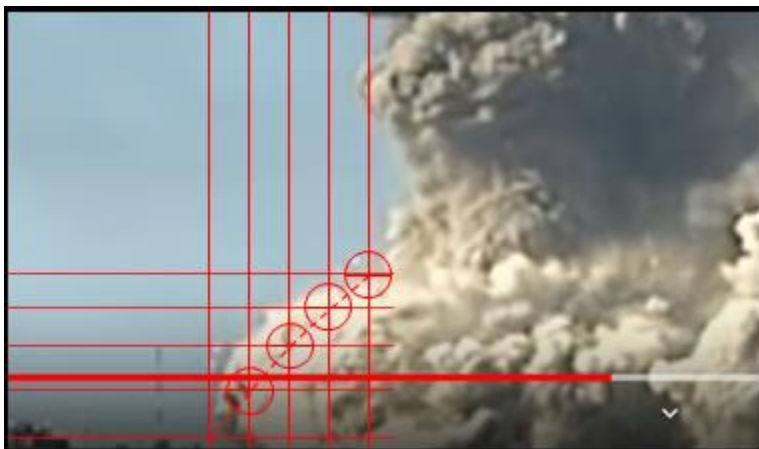


Figure 11: Location of the perimeter wall section after 1.00 sec



Figure 12: Location of the perimeter wall section after 1.33 sec

Quantifying Dimensions

Adjusting for the camera's perspectives of approximately 24 degrees, the 208-foot width of the South Tower can be used as a reference for the dimensions (Figure 13). Assuming that the vertical and horizontal aspect ratios of the video are equal, the vertical acceleration can be estimated.

From an analysis of the movement, the perimeter columns were traveling horizontally at a calculated constant velocity of about 80 ft/sec. At this velocity, the perimeter columns would have been traveling for approximately 2.27 seconds after their initial expulsion from the Tower – if accelerated to this velocity instantaneously.

However, because physical objects do not accelerate to their final velocity instantaneously, huge propelling forces working for a fraction of a second would have been necessary to accelerate these columns to a velocity of 80/ft/sec.

Based on the measurements, the observed vertical acceleration is estimated at only 27 ft/sec² – which is about 85 percent of the actual 32.2 ft/sec² freefall acceleration due to gravity. Because the perimeter columns are moving in three-dimensional space accurate quantification may not be possible from two-dimensional images.

Additionally, because of the chaotic nature of the dust and debris cloud, and the numerous perimeter columns forming a line behind each other from the camera's viewpoint, it is also probable that a taller perimeter column section emerged from the dust and its top was the final object measured. A difference in measurement of only 10 feet over the 1.33 seconds would account for the difference between the observed acceleration and the expected vertical acceleration. For reference, the difference in height between adjacent perimeter column sections is 12 feet (e.g., the difference in height of a 'brown' column section and an 'orange' column section in Figure 2).

Lastly, it is not possible to attribute the lower than expected vertical acceleration to the perimeter columns receiving some vertical support from below (e.g., observing the end of a rigid, rotating stick that is falling). Such a mechanism is inconsistent with the observed constant horizontal velocity and the behavior of slender structures that fall and rotate¹².

However, there is no doubt that these perimeter columns were unsupported and falling through the air—which means their true vertical acceleration must have been 32.2 ft/sec².

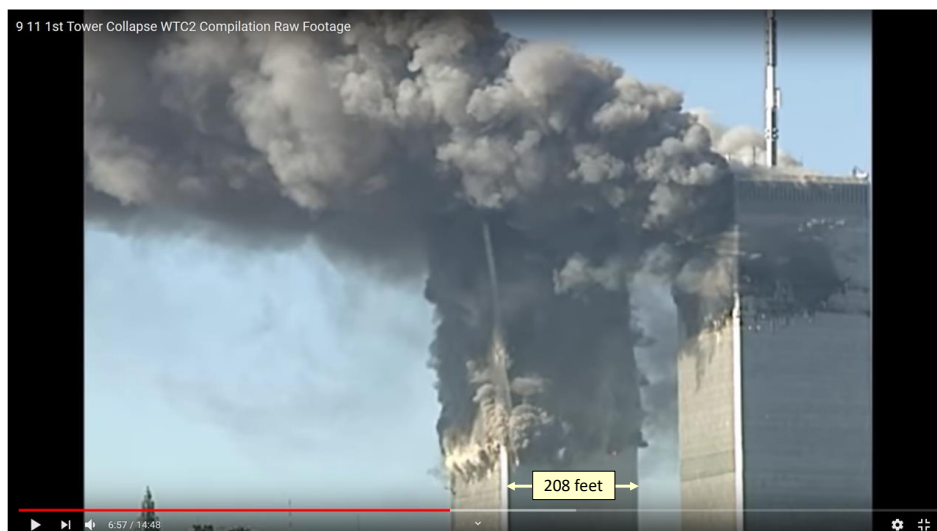


Figure 13: Full screen capture of DeJong video shows the basis for measuring distances.

¹² Varieschi, Gabriele & Kamiya, Kaoru. (2002). Toy models for the falling chimney. American Journal of Physics. 71. 10.1119/1.1576403, https://www.researchgate.net/publication/2168068_Toy_models_for_the_falling_chimney

Analysis of the Trajectory

Based on the observed locations in Figure 8 through Figure 12, and adjusted for perspective, the video shows that these contiguous multi-ton perimeter column sections were propelled horizontally at nearly 80 ft/sec (54 mph) eastward away from the South Tower.

Figure 14 shows the approximate location of these perimeter columns relative to the Tower face. Figure 15 shows the change in position over time, which is the horizontal velocity. This horizontal velocity is observed to be constant.

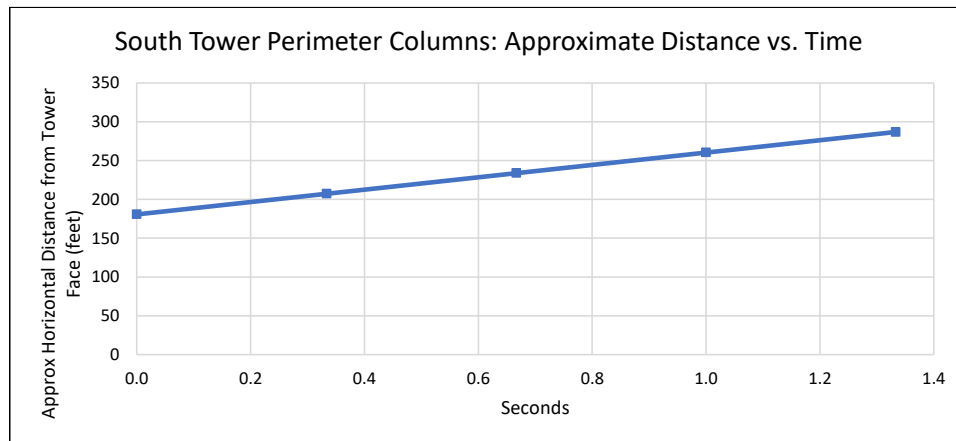


Figure 14: Observed horizontal distance from the South Tower Face

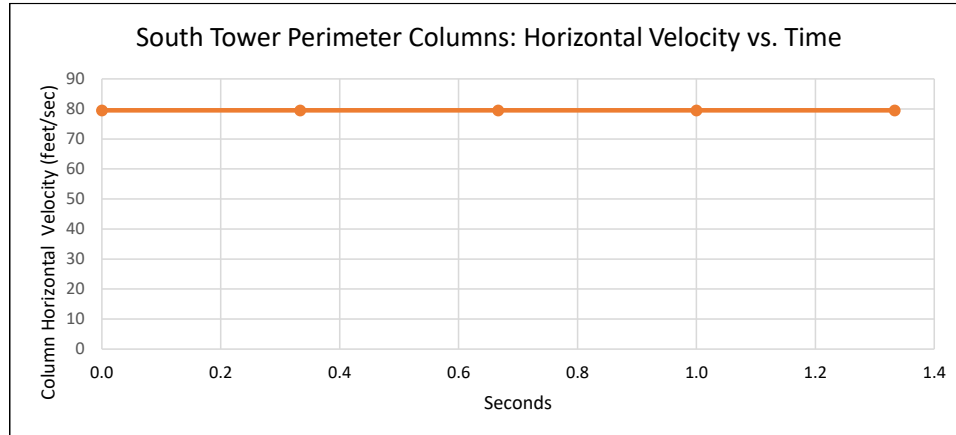


Figure 15: Observed horizontal velocity

Figure 16 shows the vertical locations relative to the first observation. From these locations the velocities can be calculated as shown in Figure 17. There is a slight change in vertical velocity during this 1.33 second interval. Calculating the change in velocity during this period, the observed acceleration is estimated to be in the range of 26.8-27.5 ft/sec², which is approximately 85 percent of the value for objects experiencing freefall acceleration. The calculated acceleration is shown in Figure 18. The difference in the value for acceleration vs. the expected 32.2 ft/sec² can be attributed to the problems with measurements of three-dimensional movement from a series of two-dimensional images where perspective, parallax effects and even the exact object being measured can only be approximated.

Additionally, the top of an adjacent, higher, perimeter column may have emerged later from behind the debris cloud to become the observed object, thus raising the “height” of the apparent object in the final measurement (e.g., the difference in height of a ‘brown’ column section and an ‘orange’ column section in Figure 2), which would reduce the calculated value of acceleration.

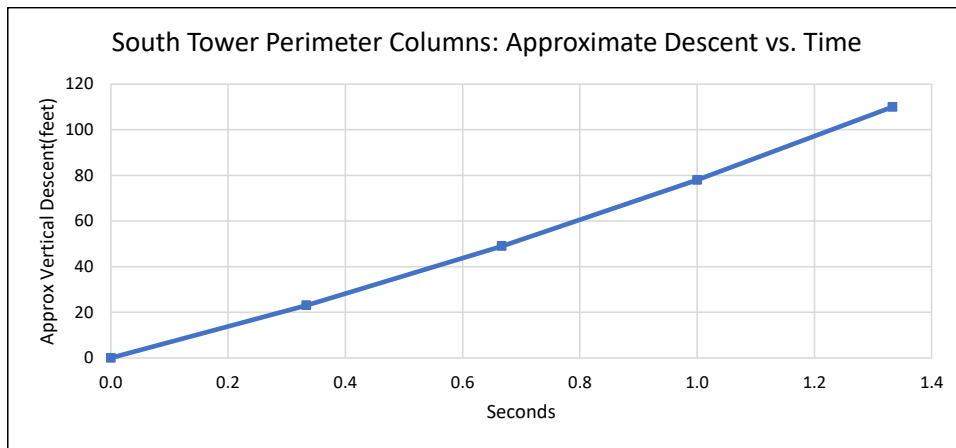


Figure 16: Observed vertical position relative to first observation

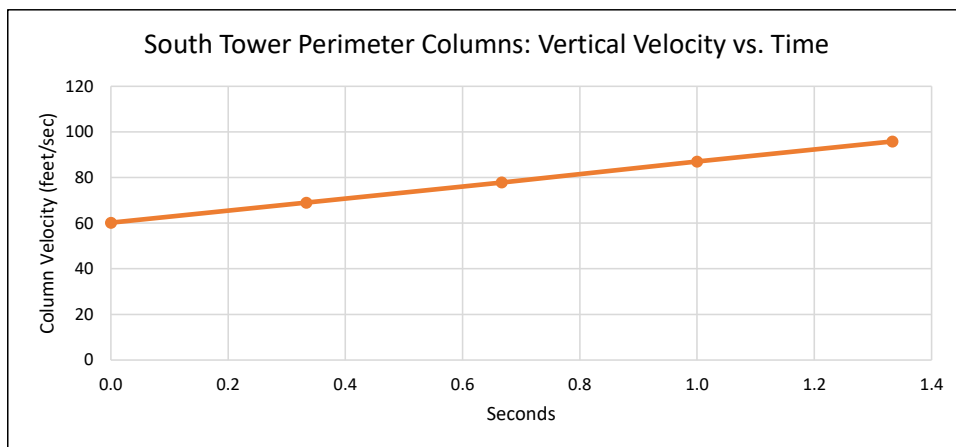


Figure 17: Observed velocity

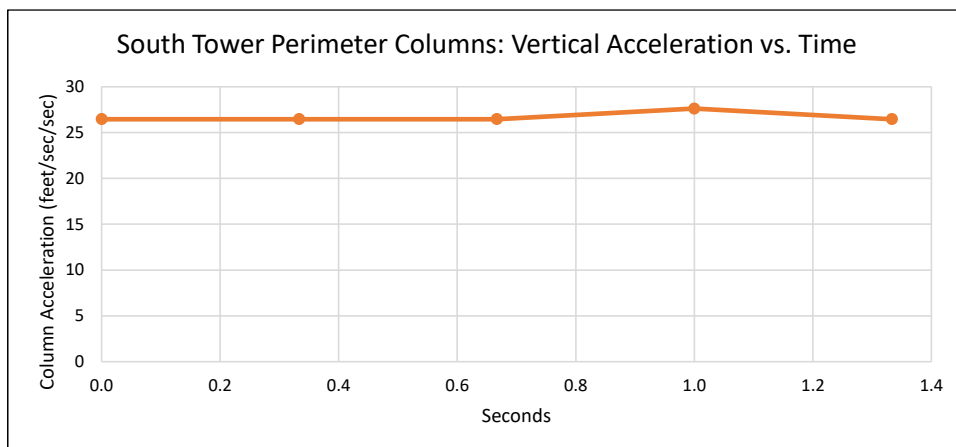


Figure 18: Observed acceleration of columns experiencing freefall acceleration (measurement error is low by approximately 17 percent)

Initial location

Using the values for velocity and acceleration quantified in the DeJong video when the perimeter column sections were visible, Figure 19 shows that the initial location of the perimeter column wall section can be traced back to its original location in the face in the South Tower. The orange circles in Figure 20 through Figure 22 show the path traveling backwards toward the wall at the 80th floor in time-steps of 1.00, 2.00 and 2.27 seconds prior to the initial emergence of the perimeter columns from the cloud of dust and debris. At this time, these perimeter columns would have originated at the interface level between the hinging top block and the lower portion of the Tower.

Additionally, the observed orientation of the columns as they travel away from the Tower wall shows the upper part leaning outward, as hypothesized in the propelled demolition¹³ paper.

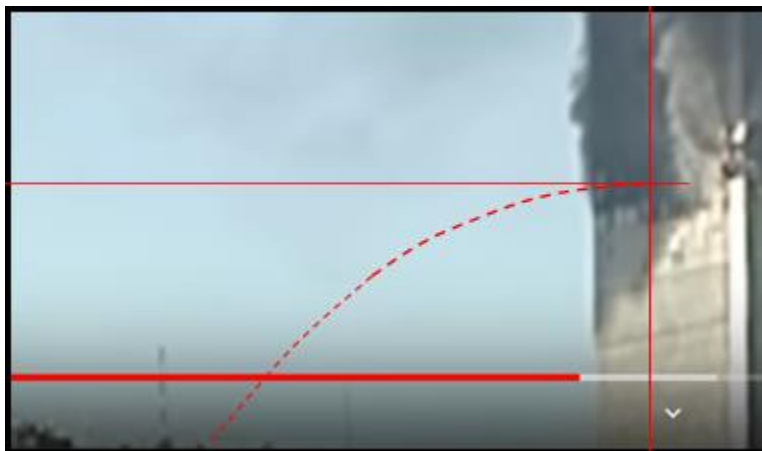


Figure 19: Starting location of the perimeter column wall section at the 80th floor of the east face as imputed from the horizontal and vertical velocities and accelerations.



Figure 20: Implied location 1.00 second before initial observation (red circle is the location of the initial observation; orange circle is the imputed location 1.00 second earlier).

¹³ Coste, Wayne, The Case for Propelled Demolition

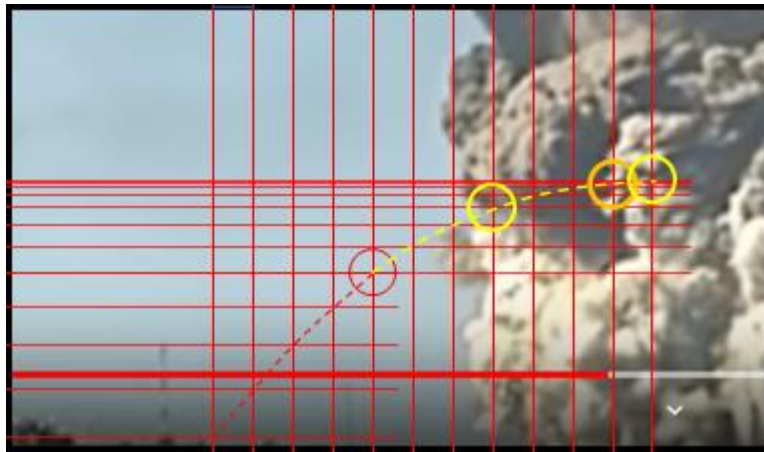


Figure 21: Implied location 2.00 second before initial observation (red circle is the location of the initial observation: orange circle is the imputed location 2.00 second earlier).

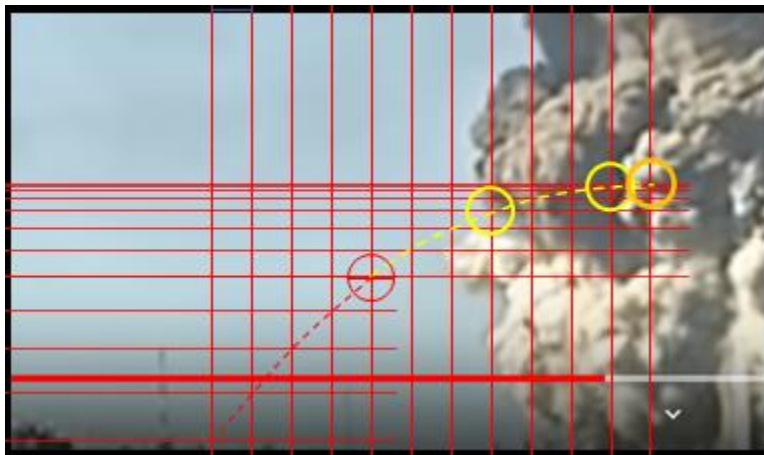


Figure 22: Implied location 2.27 seconds before initial observation is at the 80th floor (red circle is the location of the initial observation: orange circle is the imputed location 2.27 second earlier).

Standing Core Columns

One of the remarkable details captured in the [“Skidmore, Owings & Merrill - from Dean Reviere” \(“Reviere”\)](#)¹⁴ video is a three second segment where the core columns of the South Tower are clearly seen standing stationary once the outer perimeter columns and office areas were propelled away. The presence of these stationary core columns disproves any core column failure in the lower 2/3 of the South Tower much the same as the standing core of the North Tower, (e.g., “the ghost spire”) disproves core column failure in the North Tower, and supports the hypothesis that externally directed horizontal forces violently propelled the outer perimeter columns and office areas outward in all directions.

Figure 23 shows a screenshot from this segment of the video with the standing core columns highlighted within a black rectangle. The video segment is long enough to observe the stability of these core columns and the establish that they are not descending. The details show both horizontal and vertical structural components of the core that are congruent with the structural members shown in the

¹⁴ WTC Viewed from: Southeast with Camera Location: 14 Wall Street (25th floor, SOM NYC office), Manhattan (*ibid*)

construction photo of the South Tower.

It can also be observed that no drywall or other wall material is present separating the office area from the core. It would be expected that in a gravity only collapse, some portions of the wall would have been protected from falling debris as occurred in the atrium area of the North Tower¹⁵ as shown in Figure 24.

Additionally, the wobbling northeast corner section of the perimeter columns, seen in the DeJong and other videos, is also captured in this segment of the video.



Figure 23: Details of the stationary core columns are seen in the Reviere video once the outer perimeter columns and floor trusses have been propelled away. Inset photo shows the South Tower core during construction from a similar perspective.

¹⁵ Jason Scott, "10-04-01 PM 110-1021_IMG, (<https://flic.kr/p/2gb7TFM>)" Ground Zero Photographs (September-October 2001), <https://www.flickr.com/photos/textfiles/albums/72157708997281912/>



Figure 24: Wall boards surround the stairway where 13 survivors of the North Tower demolition were located suggesting horizontal propellant forces were absent at this location and falling debris did not dislodge wall board material.

Conclusion

Most of the width of an exterior wall was recorded emerging from the cloud of dust and debris during the demolition of the South Tower. This “surfing” wall included at least eight contiguous perimeter column sections – approximately 80 linear feet -- that are clearly visible. An analysis of the video images allows its position, velocity and acceleration to be estimated. When first observed, the perimeter columns were approximately 200 feet east of their original location in the South Tower façade. At this distance from the nearest possible structure, they would be falling under freefall acceleration.

The observed velocity and acceleration can be used to trace this perimeter column section back to its origin at approximately the 80th floor of the South Tower. The movement of these contiguous perimeter column sections cannot be explained by either molecular (“high”) explosives or mechanical expulsion from a collapsing structure. The movement is consistent with the concept of a propelled demolition as described in a [previous paper](#)¹⁶.

Furthermore, the hinging motion of the lower east side of the top block into the interior of the South Tower created a geometry unique in the destruction of the Twin Towers, whereby the propellant forces originating from floors 81 and above were additive to the propellant forces at the 80th floor.

¹⁶ Coste, Wayne, The Case for Propelled Demolition

Finally, a review of the stationary, standing core columns with no drywall or other wall material visible supports the presence of large horizontal propelling forces. Due to the lack of significant damage to the core, these propelling forces cannot be explained by local detonations – either large or small. Small detonations would not have had the energy to propel the entire multi-floor wall sections at 80 ft/sec. Detonations large enough to propel the wall would have destroyed the core and left very distinct sounds in the auditory record.

Appendix

The following sequence of 32 image groups provides time-synchronized comparisons of the South Tower demolition from three distinct perspectives. This allows the destructive forces and the resulting movements to be placed in context. At about $t=5.75$ seconds in this series, the perimeter column sections emerge from the cloud of dust and debris. This means that at a time between $t= 3.25$ and 3.50 seconds, the perimeter columns are being separated from the wall of the South Tower and accelerated horizontally. In the following sequence, the images on the left are from the "[Skidmore, Owings & Merrill - from Dean Reviere](#)" ("[Reviere](#)")¹⁷ video, the images on the right are from the [Onno De Jong video](#) ("[DeJong](#)")¹⁸ and the images at the bottom are from [Jim Smith/WCBS-TV \(CBS2-NY\) Chopper 2](#)¹⁹ which were taken looking north from directly south of the South Tower.

Other videos of the collapse of the South Tower are available²⁰.

¹⁷ WTC Viewed from: Southeast with Camera Location: 14 Wall Street (25th floor, SOM NYC office), Manhattan (*ibid*)

¹⁸ WTC2 Collapse: NE View by Onno DeJong (*ibid*)

¹⁹ WTC2 Collapse: S View by Jim Smith/WCBS-TV Chopper 2, <https://youtu.be/zw-pH-rAHkM>, (MrKoenig1985, Uploaded July 23, 2020)

²⁰ Nico D, 9/11 WTC 2 South Tower Collapse Compilation (For The 18th Anniversary), <https://youtu.be/zw-pH-rAHkM>, Sep 11, 2019

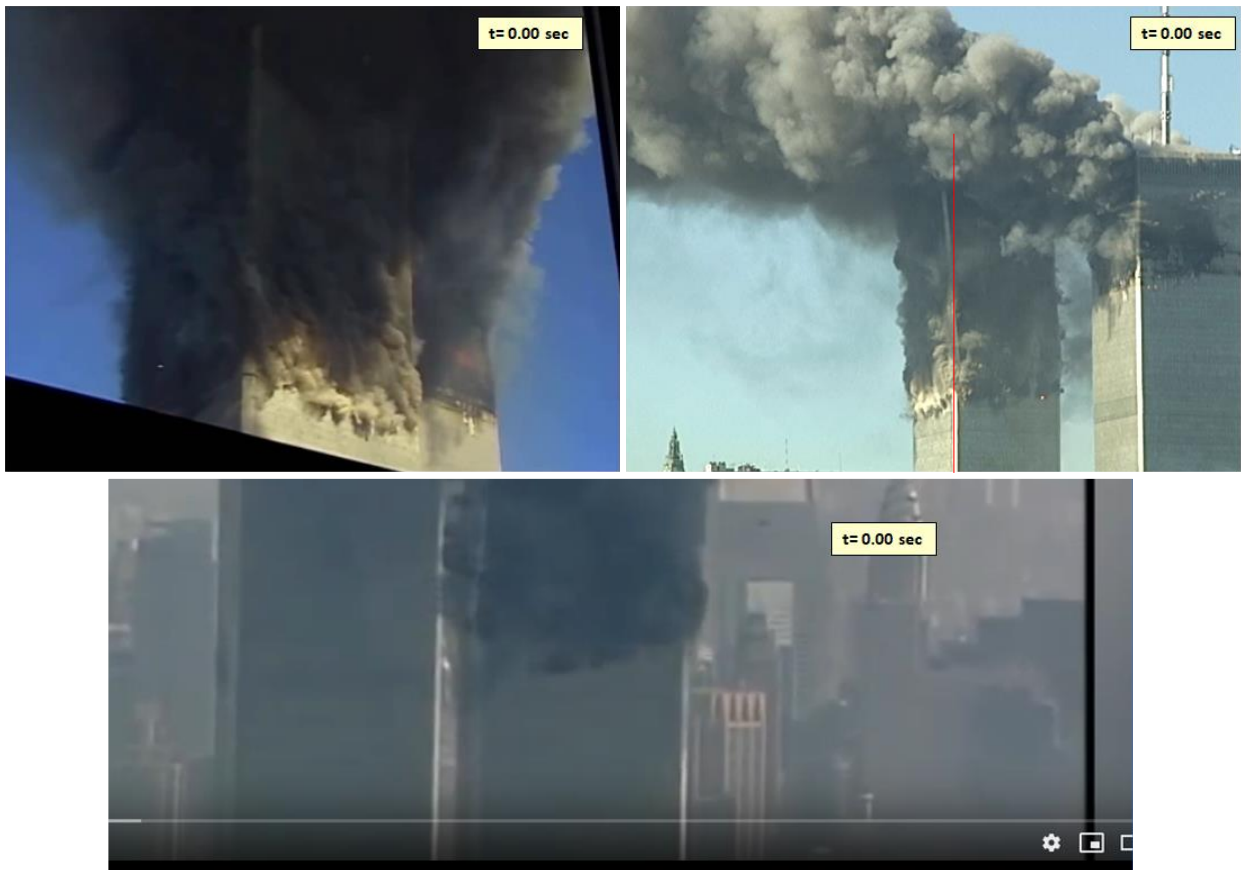


Figure Appendix 1: At t=0.00 sec – White clouds of dust and debris begin to be ejected horizontally from approximately the 80th floor as the top is seen hinging to the east. A vertical red line shows the continuation of the corner and will be used as a reference in several subsequent images.

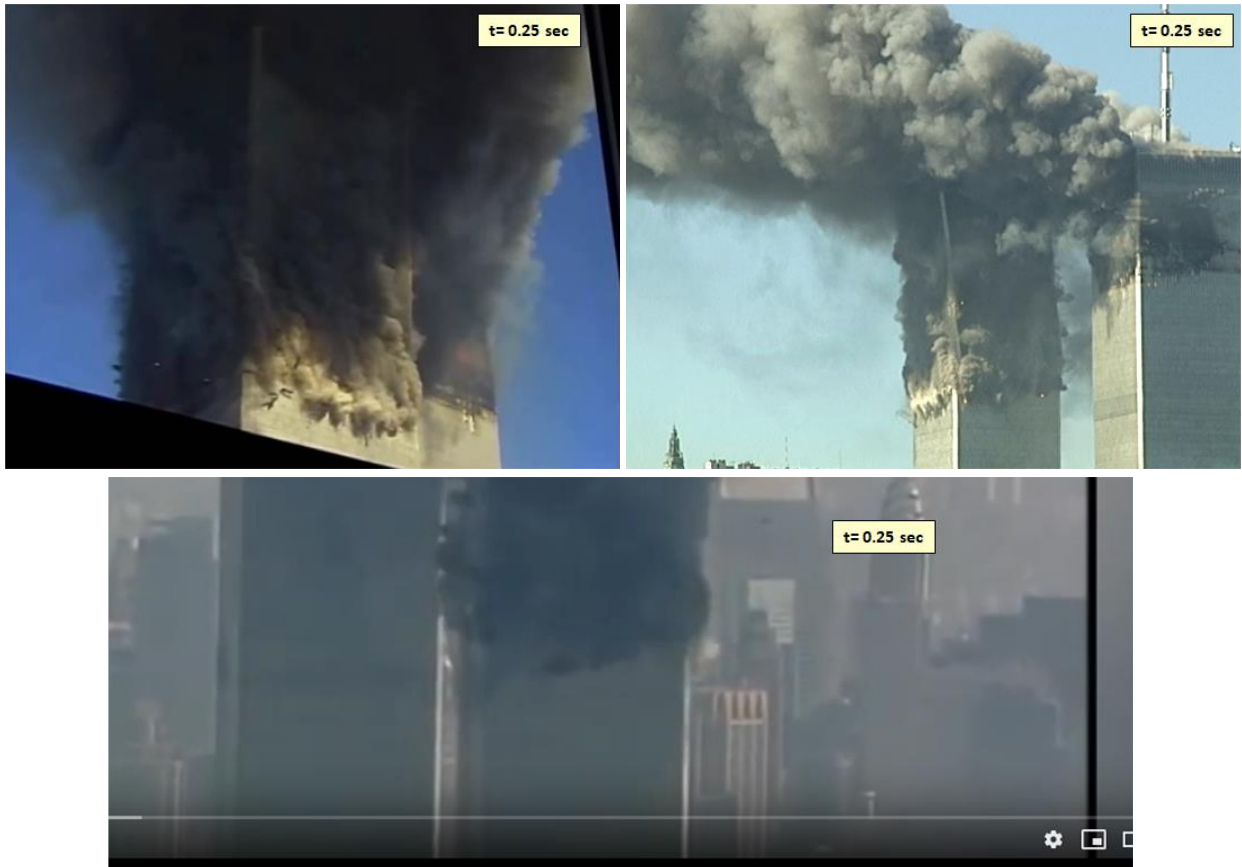


Figure Appendix 2: At $t=0.25$ sec – Horizontal forces push the cloud of dust and debris further from the wall.

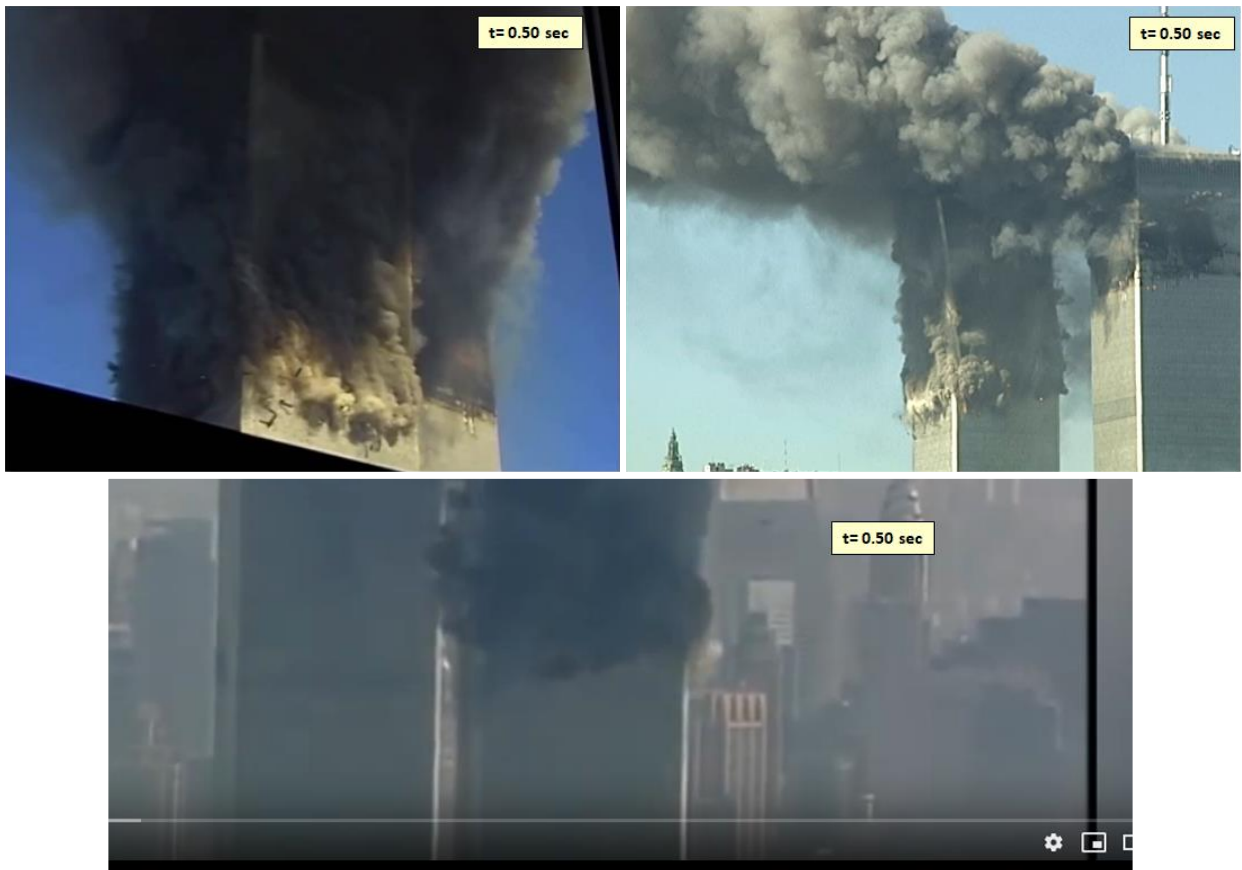


Figure Appendix 3:: At $t=0.50$ – The east and north sides of the top of the South Tower are visible in the “Reviere” and “DeJong” videos, respectively.

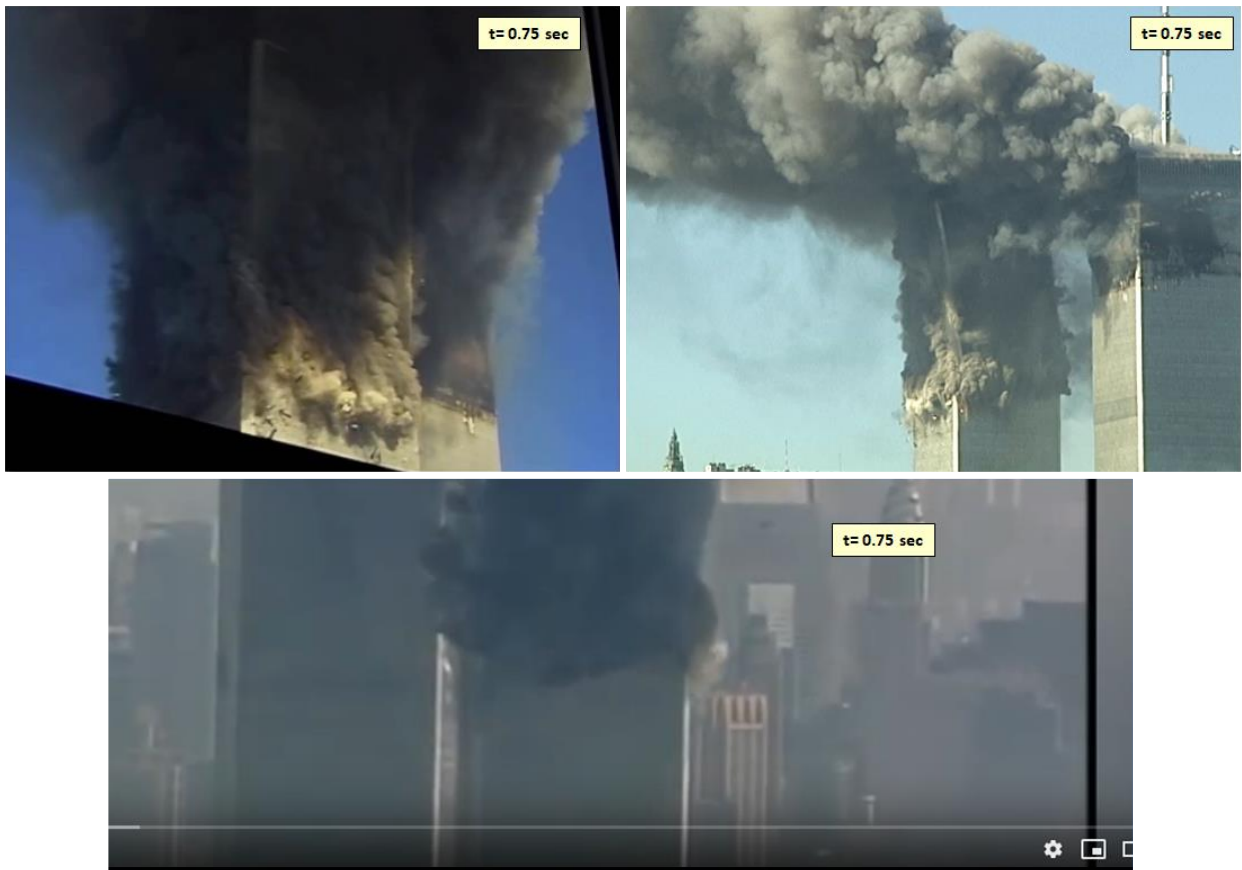


Figure Appendix 4: At $t=0.75$ – The east and north sides of the top of the South Tower are visible in the “Reviere” and “DeJong” videos, respectively. Increased hinging eastward of the Tower is observed in both videos.

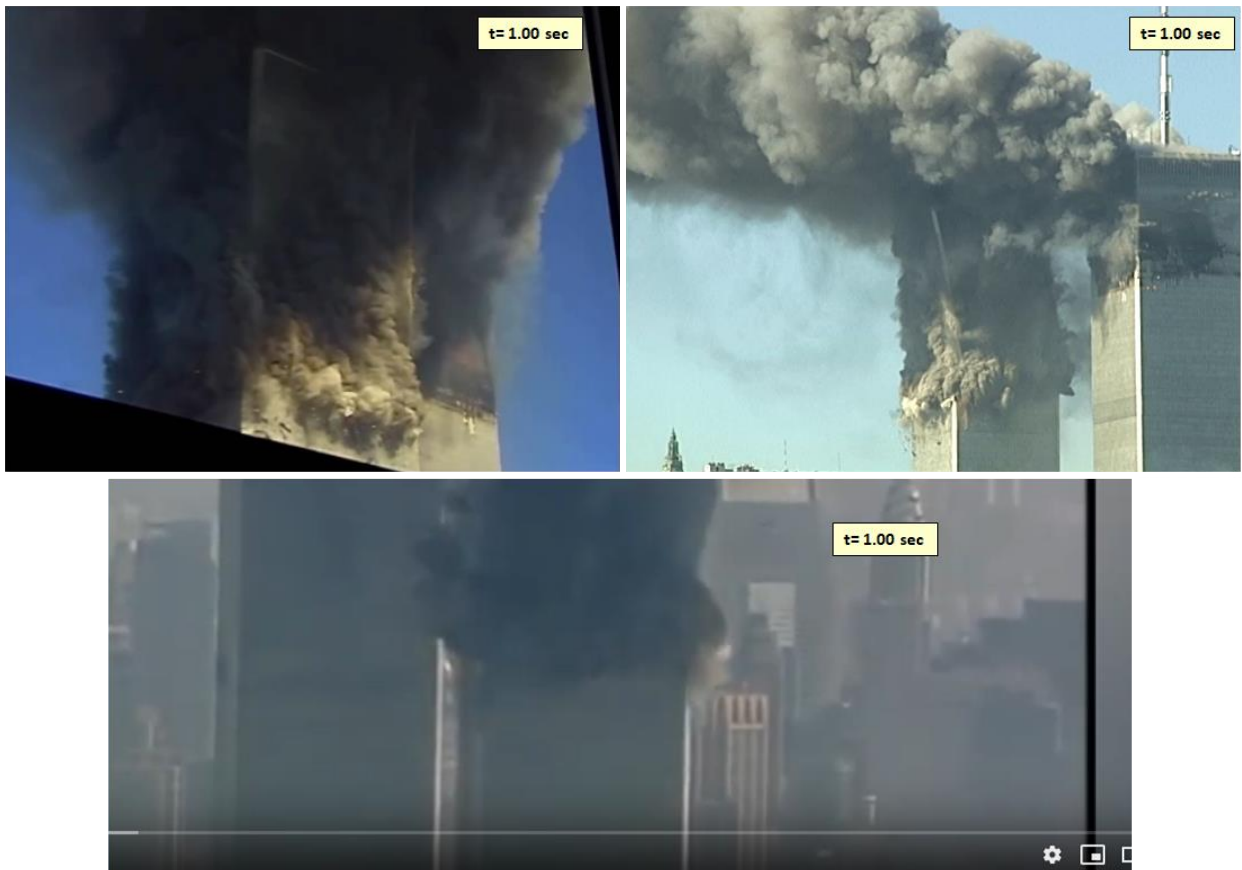


Figure Appendix 5: At $t=1.00$ sec – The east and north sides of the top of the South Tower remain visible in the “Reviere” and “DeJong” videos, respectively. Increased hinging eastward of the Tower is observed in both videos.

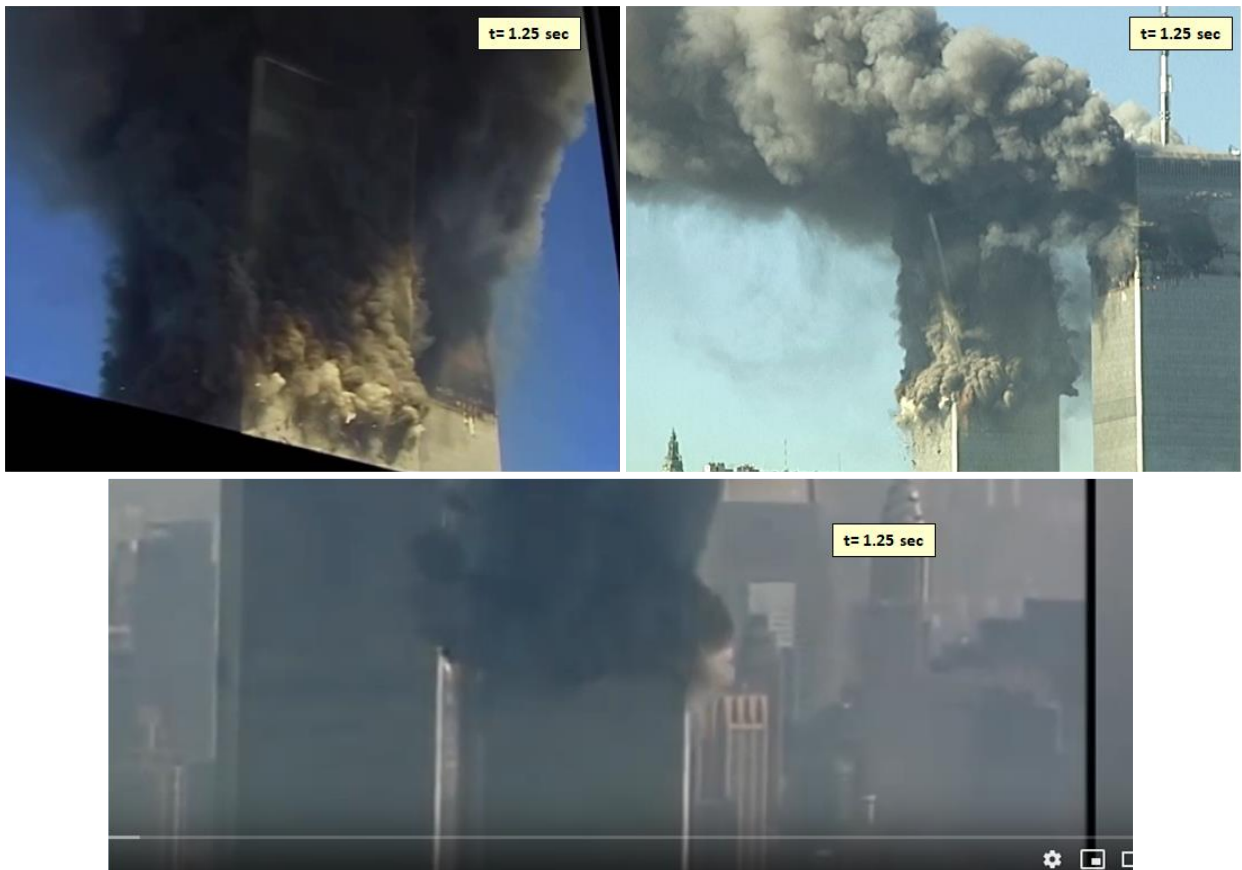


Figure Appendix 6: At $t=1.25$ – Increased hinging eastward of the Tower is observed in both videos, large pieces of the façade are seen falling in both videos.

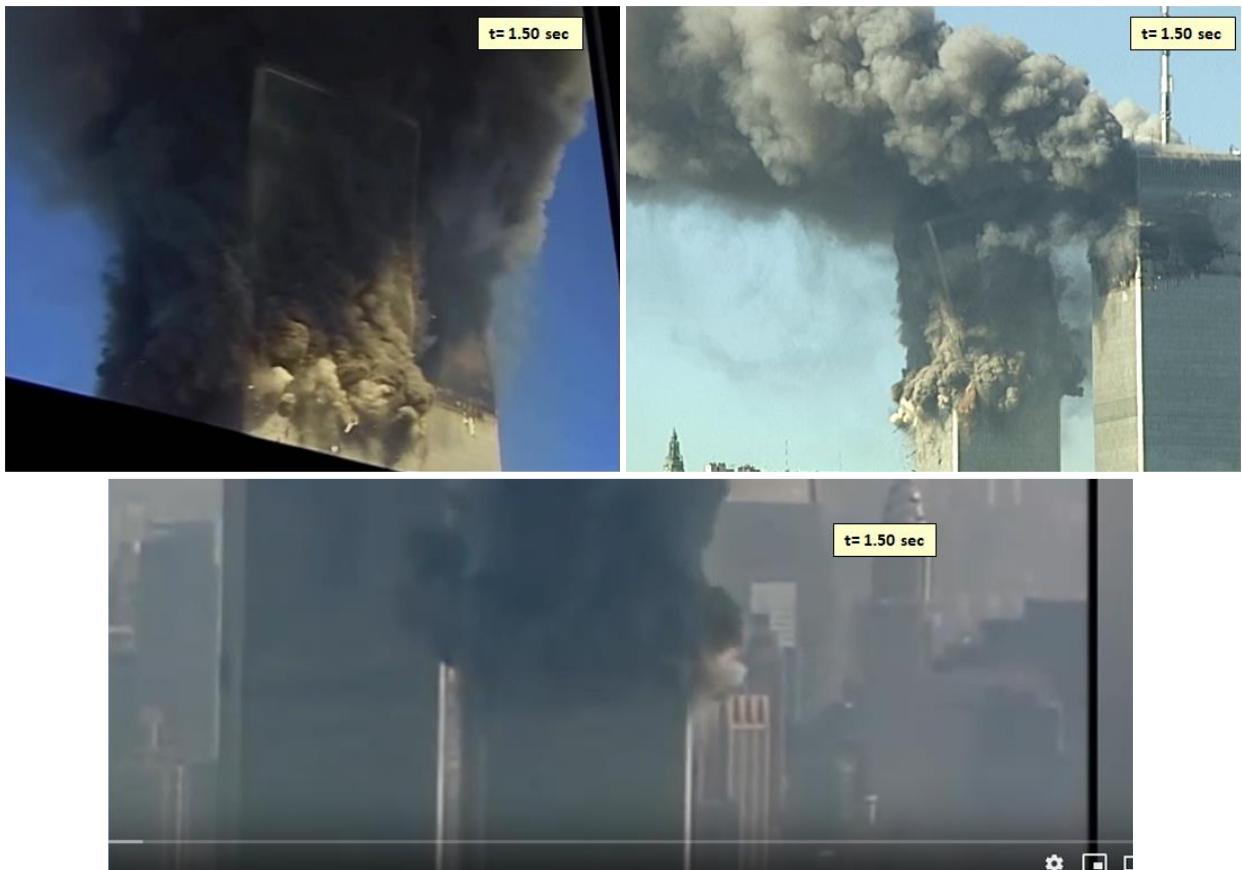


Figure Appendix 7: At $t=1.50$ – Increased hinging eastward of the Tower is observed in both videos, large pieces of the façade are seen falling in both videos.

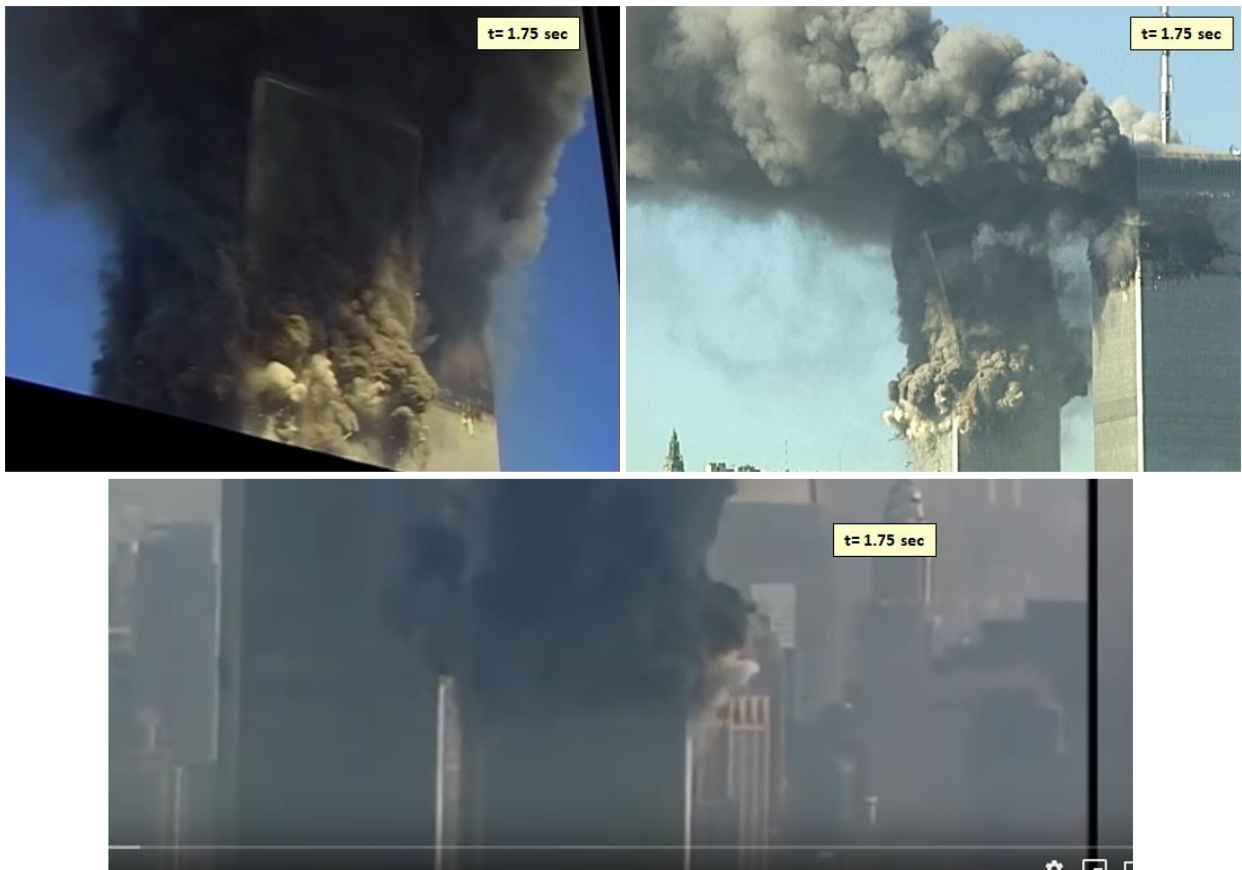


Figure Appendix 8: At $t=1.75$ – The east and north sides of the top of the South Tower are visible in the “Reviere” and “DeJong” videos, respectively. The hinging motion is clearly seen in the “DeJong” video as the top corner descends and the west side (top and bottom) is deflected westward.

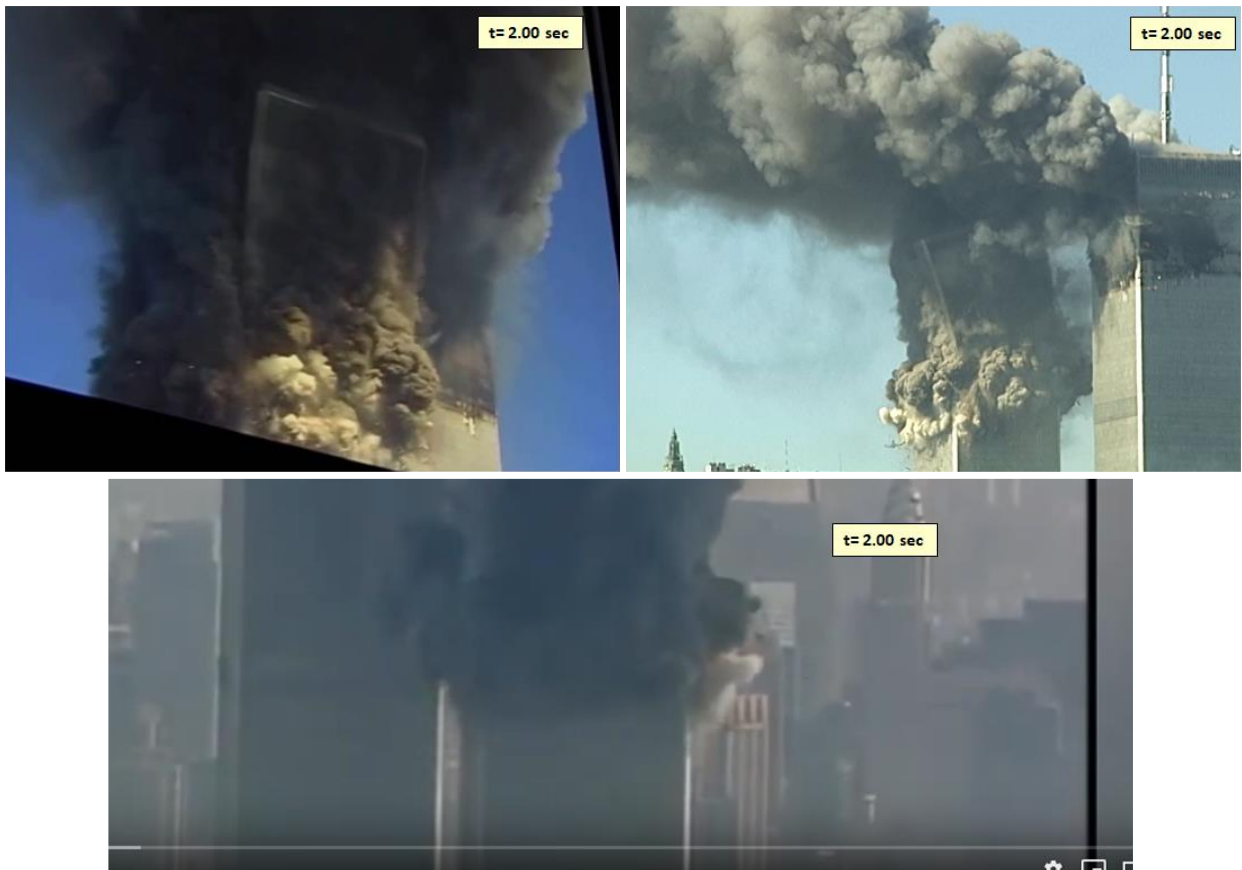


Figure Appendix 9: At $t=2.00$ – The east and north sides of the top of the South Tower are visible in the “Reviere” and “DeJong” videos, respectively.

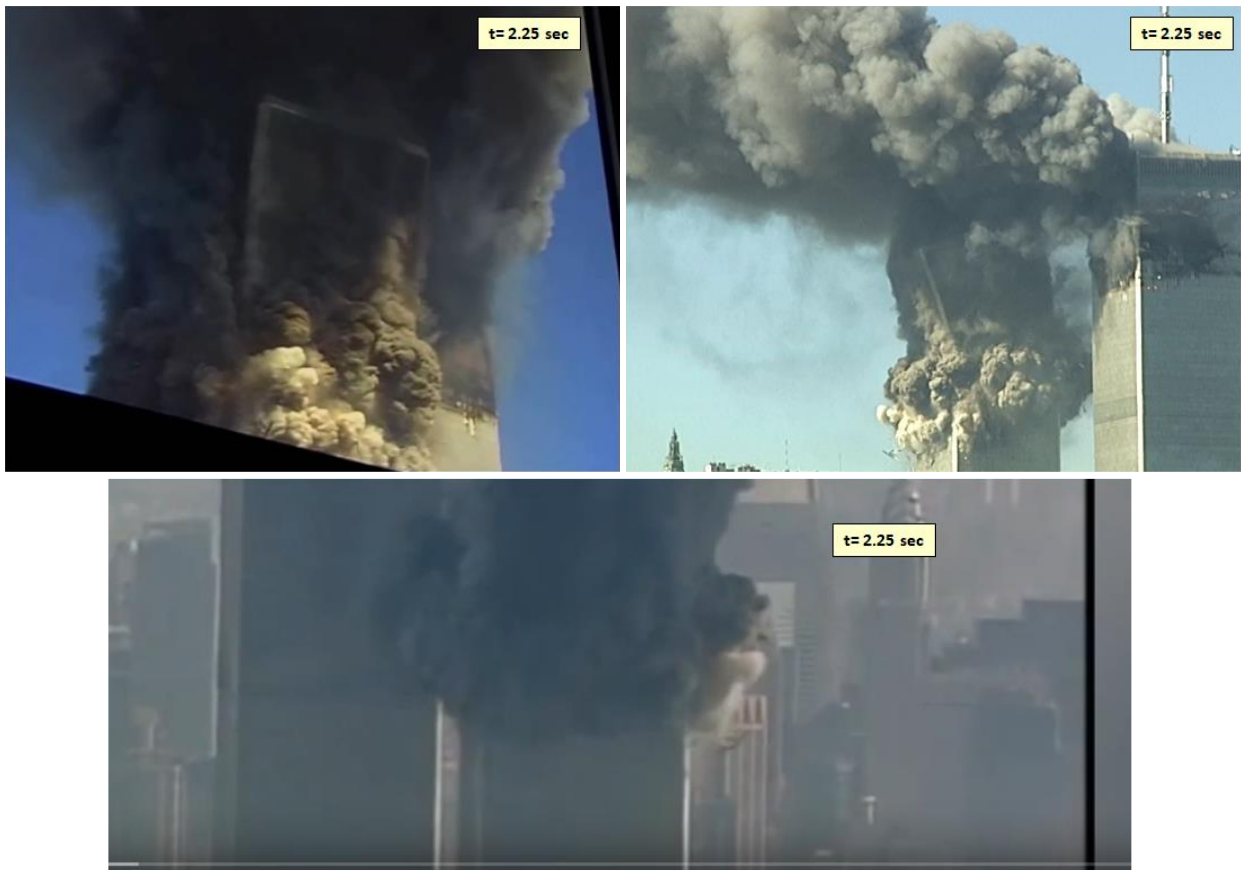


Figure Appendix 10: At $t=2.25$ – The east and north sides of the top of the South Tower are visible in the “Reviere” and “DeJong” videos, respectively.



Figure Appendix 11: At $t=2.50$ – The east and north sides of the top of the South Tower are visible in the “Reviere” and “DeJong” videos, respectively.



Figure Appendix 12: At $t=2.75$ – The east and north sides of the top of the South Tower are visible in the “Reviere” and “DeJong” videos, respectively.

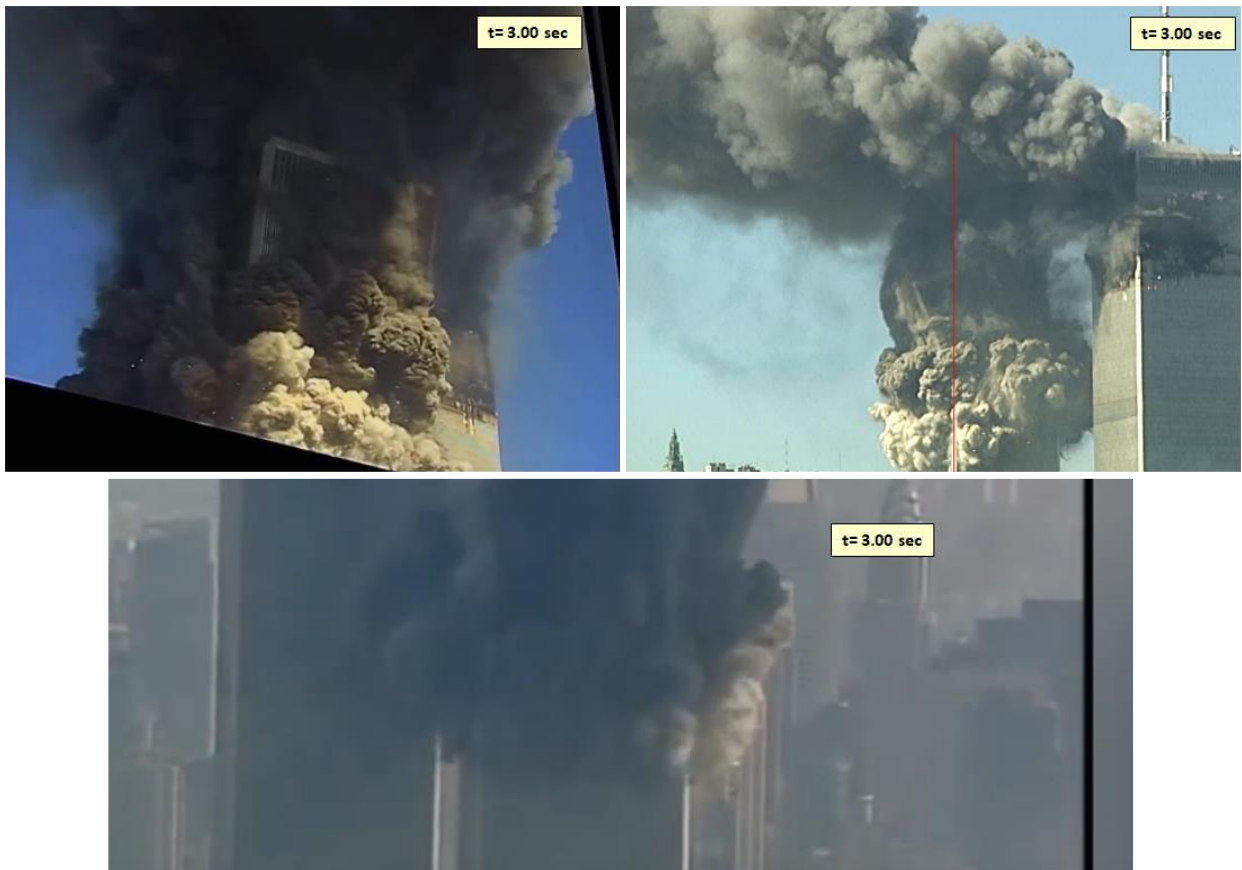


Figure Appendix 13: At $t=3.00$ – The east and north sides of the top of the South Tower are visible in the “Reviere” and “DeJong” videos, respectively.

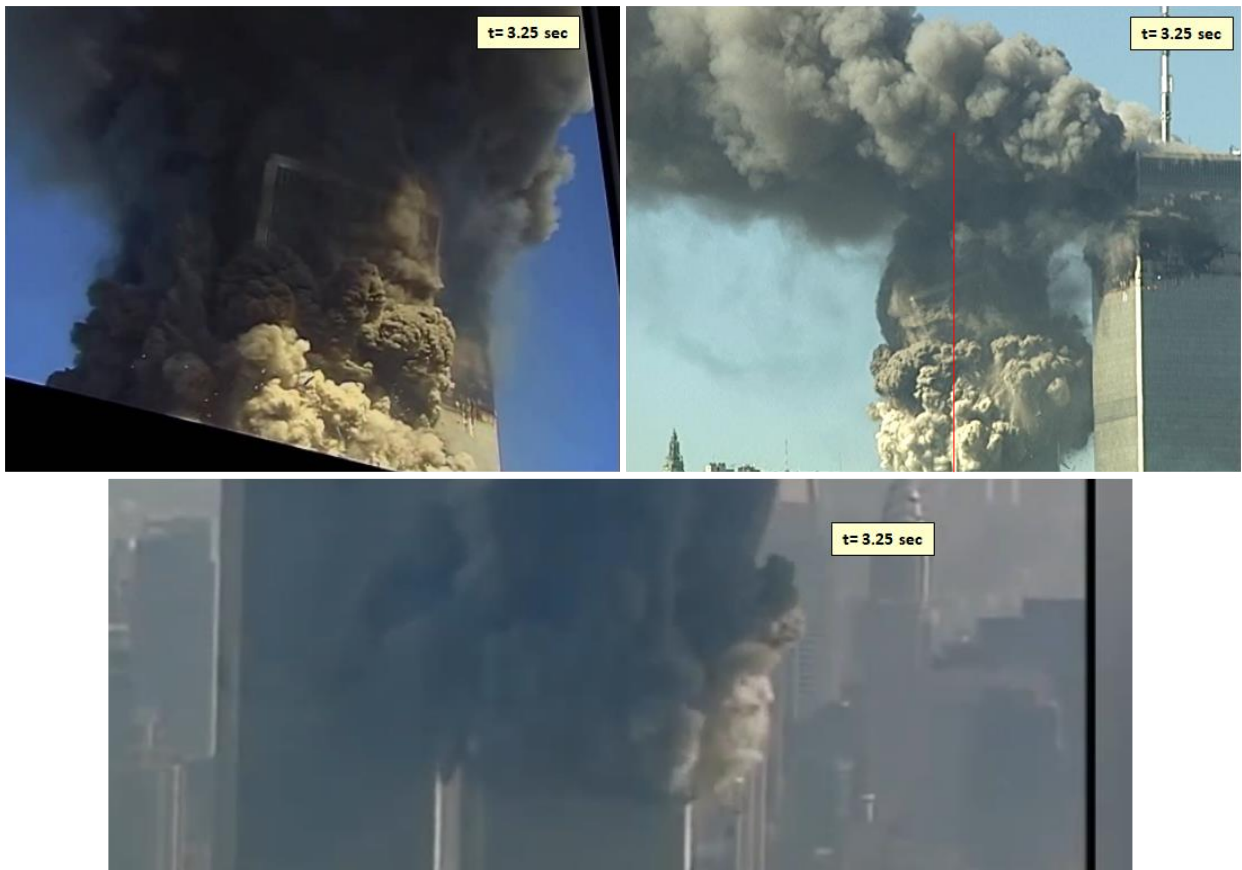


Figure Appendix 14: At $t=3.25$ – The east and north sides of the top of the South Tower are visible in the “Reviere” and “DeJong” videos, respectively. This is approximately when the perimeter column wall section would have separated and been in the process of being accelerated to 80 ft/sec.

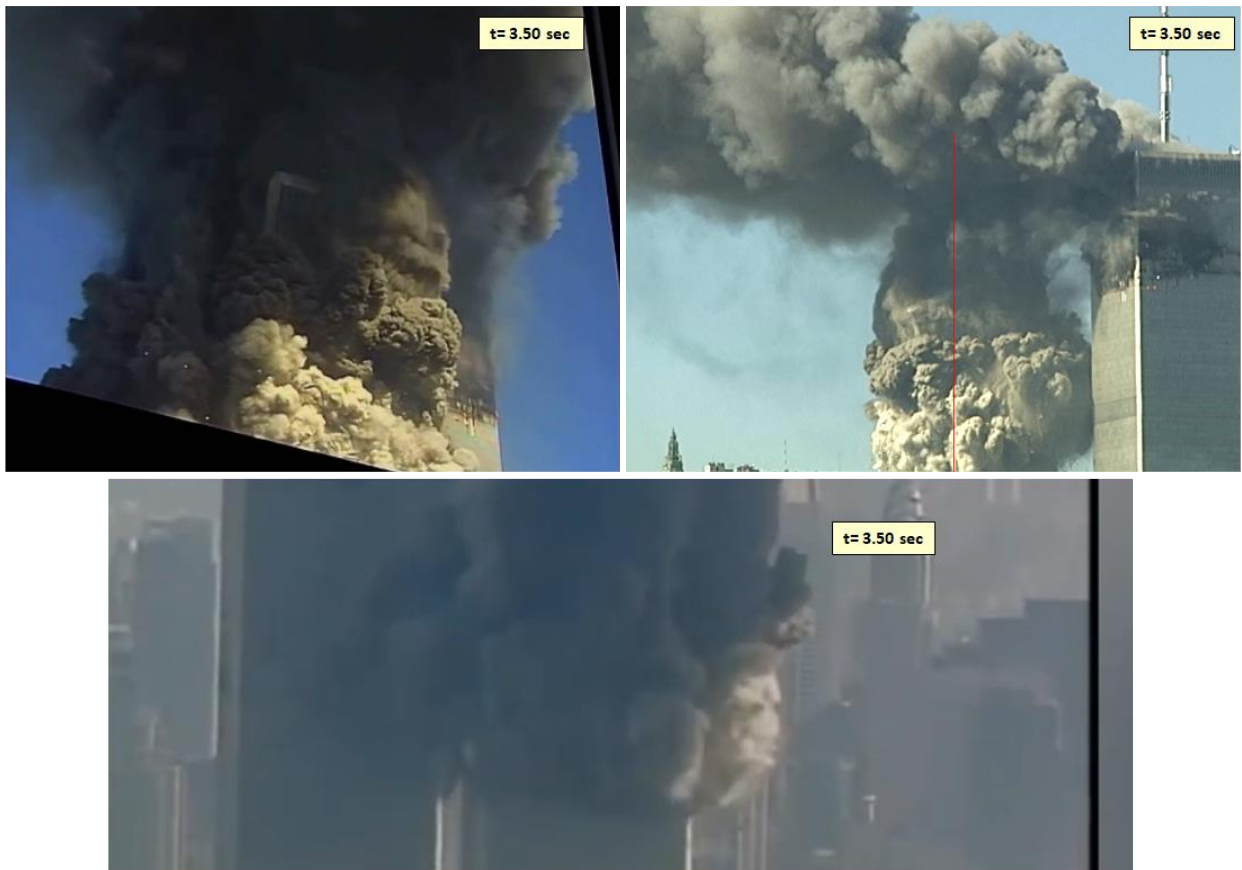


Figure Appendix 15: At $t=3.50$ – The east and north sides of the top of the South Tower are visible in the “Reviere” and “DeJong” videos, respectively.

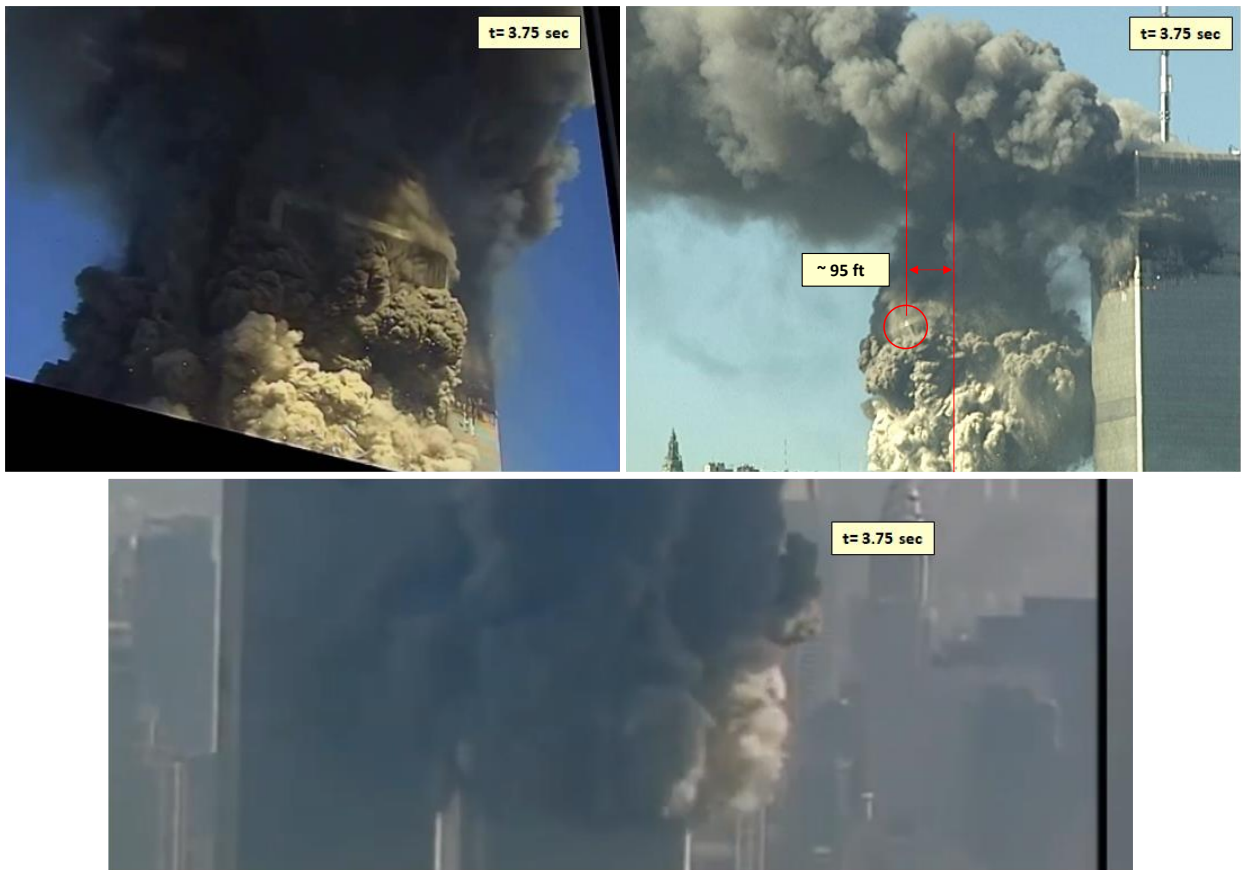


Figure Appendix 16: At $t=3.75$ – The east and north sides of the top of the South Tower are visible in the “Reviere” and “DeJong” videos, respectively. At this time the corner of the South Tower is approximately 95 feet over the east edge of the South Tower. At this distance from the tower, gravity-only forces could not dismember this corner and the corner should have remained visible as it plummeted to the ground. But instead, it was dismembered by other, propellant, forces.



Figure Appendix 17: At $t=4.00$ – The east side of the top of the South Tower in the “Reviere” video, while the north side is barely visible in the “DeJong” video.



Figure Appendix 18: At t=4.25 – The top descends behind black smoke in the “Reviere” video, and is completely obscured in both videos.



Figure Appendix 19: At t=4.50– The cloud of dust and debris expands with no structure clearly discernable.



Figure Appendix 20: At $t=4.75$ sec – Outlines of perimeter columns are seen in “Reviere” video, but not identifiable in either the “DeJong” or “unnamed” video.



Figure Appendix 21: At $t=5.00$ sec – Outlines of perimeter columns are seen in “Reviere” video, but not identifiable in the “DeJong” or “unnamed” video.



Figure Appendix 22: At t=5.25 sec – Outlines of the perimeter columns are seen in the “Reviere” video, but are not identifiable in the “DeJong” or “unnamed” video. They begin to emerge in the “unnamed” video.



Figure Appendix 23: At t=5.50 sec – Perimeter columns begin to emerge in the “Reviere” video and begin to emerge in the “DeJong” video. They are clearly visible in the “unnamed” video.



Figure Appendix 24: At t=5.75 sec – Perimeter columns continue to emerge in the “Reviere” video and are clearly seen in the “DeJong” and “unnamed” video.



Figure Appendix 25: At t=6.00 – Perimeter columns are clearly seen in the “Reviere,” “DeJong” and “unnamed” video.



Figure Appendix 26: At t=6.25 sec – Perimeter columns are clearly seen in the “Reviere,” “DeJong” and “unnamed” video. At this point they are over 200 feet from the east side of the Tower.



Figure Appendix 27: At t=6.50 – Perimeter columns are clearly seen in the “Reviere” video and in the “DeJong” video. These perimeter column sections are captured in the “unnamed” video.



Figure Appendix 28: At t=6.75 – Perimeter columns are clearly seen in the “Reviere” video and top of the columns remains visible in the “DeJong” video. These perimeter column sections are captured in the “unnamed” video.



Figure Appendix 29: At t=7.00 – Perimeter columns are clearly seen in the “Reviere” video and descend out-of-sight in the “DeJong” video. These perimeter column sections are captured in the “unnamed” video.



Figure Appendix 30: At $t=7.25$ sec – Perimeter columns continue to be seen clearly in the “Revire” video.



Figure Appendix 31: At $t=7.50$ sec – Top of the perimeter columns continue to be seen in the “Revire” video.



Figure Appendix 32: At $t=7.25$ sec – Only the path of some of the columns through the dust cloud remains visible in the “Reviere” video.