

was to determine the potential for a classic progressive collapse, i.e., disproportionate structural damage from a single failure, regardless of the cause of that failure.

The following are the principal findings from these simulations.

- The best estimate simulation led to global collapse of WTC 7 and provided a reasonable sequence and timing of the events leading to the initiation of global collapse. As expected, there were some deviations from the observable evidence at computation times after the global collapse was underway.
- The simulation with identical debris impact damage, but reduced fire damage, did not lead to a collapse-initiating event or to collapse itself. This result indicated that the debris impact damage, by itself, was not sufficient to initiate global collapse. It also indicated that the long duration of the multiple floor fires was the primary cause of the eventual collapse.
- The simulation with the same fire-induced damage as the best estimate simulation, but with no debris impact damage, identified the same initiating event and timing of that event as did the best estimate simulation. This simulation also led to global collapse of the building, further indicating that the debris impact damage was not a principal contributor to the occurrence of collapse. However, the mechanics of the collapse differed from the best estimate simulation in the later stages of the horizontal progression of failure.
- WTC 7 was prone to classic progressive collapse in the absence of debris impact and fire-induced damage when a section of Column 79 between Floors 11 and 13 was removed. The collapse sequence demonstrated a vertical and horizontal progression of failure upon the removal of the Column 79 section, followed by buckling of exterior columns, which led to the collapse of the entire building.

The simulations supported the leading collapse hypothesis and provided the following additional insights into the sequence of events leading to the global collapse of WTC 7. Except as noted, these findings were derived from the best estimate simulation.

Initial Local Failure for Collapse Initiation

- The collapse of Floor 13 onto the floors below, some of which were already weakened by fires, triggered a cascade of floor failures in the northeast region of the building.
- The floor failures progressed down to Floor 5, where debris accumulated, and spread across the east floor area, due to the effects of impact loads from falling debris on thermally weakened floor areas.
- Critical Column 79 became laterally unsupported between Floors 5 and 14 in the east-west and south directions as a result of the progression of floor system failures. There was still some lateral support in the north direction at Floors 8 to 12 and Floor 14, as the erection bolts in the seated connections had all failed at these girder ends, but the girders had not walked off the bearing seat.