

Horizontal Progression of Collapse

- Columns 76 through 78 were the next line of columns to buckle, due to loss of lateral support, impact by falling debris, and load redistribution from Columns 79 through 81. The failure of Truss 2 was not essential to the failure of Columns 77 and 78, as they would have buckled like the other columns.
- The remaining interior columns buckled in succession from east to west in the lower floors due to loss of lateral support from floor system failures, forces exerted by falling debris impact, and load redistributed to them from other buckled columns.
- The initial westward progression and the overall speed of the collapse was not sensitive to the extent of the estimated structural damage to WTC 7 due to the debris from the collapse of WTC 1. When the global collapse was nearly complete, there was some small sensitivity to the extent of the initial damage in the southwest portion of the building.

Global Collapse

- The exterior columns buckled at the lower floors (between Floors 7 and 14) due to load redistribution to the exterior columns from the building core as the interior columns buckled and the building core moved downward. The entire building above the buckled-column region then moved downward in a single unit, as observed, completing the global collapse sequence.
- Computer simulations of the fires, the thermal heating of the structure, the thermally induced damage to the structure, and the structural collapse can be used to predict a complex degradation and collapse of a building. The overall features and timing of the prediction were consistent with the videographic evidence.
- It was recognized that uncertainties existed in the fire simulations, thermal analyses, analyses of the structural response to fires, and the analyses of global collapse, including assumptions made where data were not available. The propagation of uncertainties in the inter-dependent analyses was minimized by conducting sensitivity studies and multiple analyses with a range of values for critical parameters, and by determining the best fit between the analysis results and observed events from photographic and videographic evidence. The occurrence and timing of the analytical results closely matched the observed events (e.g., east penthouse descent, followed by global collapse), which demonstrates the effectiveness of this approach for the interdependent analyses.
- The uncertainties in predicting the precise progression of the collapse sequence increased as the analysis proceeded due to the random nature of the interaction, break up, disintegration, and falling of the debris. The uncertainties deriving from these random processes increasingly influenced the deterministic physics-based collapse process. Thus, the details of the progression of horizontal failure and final global collapse were sensitive to the uncertainties in how the building materials (steel, concrete) and building systems and contents interacted, broke up, and disintegrated.