

east-west and south directions between Floors 5 and 14. 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 seats. Thus, these girder connections possibly prevented lateral displacement in the north direction, but did not resist lateral displacements in the east, west, or south direction. At Floor 14, the girder to the west of Column 79 (between Column 79 and 76) was still attached and provided lateral restraint from the west. Figure 12–44 illustrates the girder-to-column connection status at the time of buckling of Column 79.

A separate global analysis of the structure with the same gravity loading, debris impact damage, and thermal loading, but with fire-induced damage from the ANSYS analysis at 3.5 h (instead of 4.0 h) showed that interior columns did not buckle (Section 12.4.5). The damage state at 3.5 h primarily included failure to beams and connections at the south and southeast regions of the affected floors. This global analysis, therefore, indicated that thermally-induced damage in the southeast floor region was not sufficient to cause an initial failure event.

The buckling failure of Column 79 was the initial failure event that led to the global collapse of WTC 7, as will be shown in the subsequent sections.

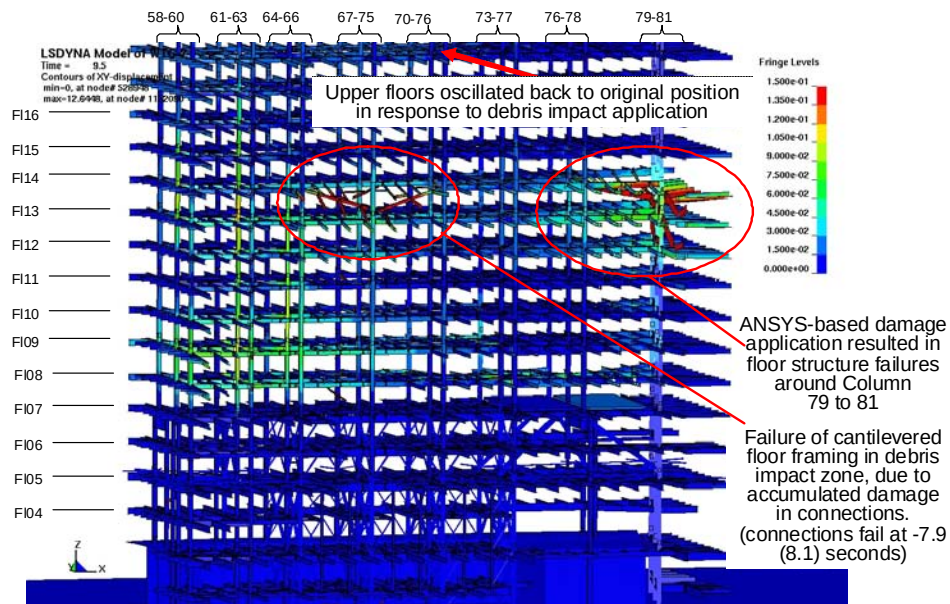


Figure 12–42. The collapse of Floors 13 and 14 in the northeast region [Time: -6.5 (9.5) s]