

13.2 DETAILED PROBABLE COLLAPSE SEQUENCE

8. **Collapse of WTC 2.** The collapse of WTC 2 did not cause any structural damage to WTC 7, nor did it ignite a fire in WTC 7. Damage caused by WTC 2 was limited to window breakage in the four-story lobby area on the south face of WTC 7.
9. **Collapse of WTC 1.** The collapse of WTC 1 caused (1) structural damage that severed seven (out of 58) exterior columns on the lower floors of WTC 7; (2) initiation of fires at 10 floors between Floors 7 and 30; (3) extensive window breakage on the south face of WTC 7; and (4) loss of city water that supplied the automatic sprinkler system on the lower zone of WTC 7.
 - The severed columns were located between Floors 7 and 17 on the south face (5 columns) and the west face (2 columns) near the corner. The analysis considered two scenarios: (1) a region of structural damage consistent with the seven severed columns extending over all 12 damaged floors and inward to the core where columns, girders, beams, and floors were removed; and (2) no structural damage. In the first scenario, the damage extended from the south face all the way to the core over the lower seven floors (only at areas where the columns were observed to be damaged), extended half way from the south face to the core over the middle three floors, and was limited to just the exterior structural framing members over the upper three floors.
 - Observations indicate that the fires were located in five distinct groups of floors (7/8/9, 11/12/13, 19, 22, and 29/30). These fires were first observed between 11 a.m. and 12:30 p.m. (WTC 1 collapsed at 10:28:22 a.m.). They were typically observed as single floor fires. Fires observed later on floors adjacent to the single floor fires were observed to lag by one half to one hour.
 - In most instances, the fire on any given floor likely initiated near the damaged southwest region, though collapse initiation did not occur until nearly seven hours later in the northeast region. Unlike the WTC towers, there was no dispersion of jet fuel in WTC 7 causing simultaneous fire initiation over extensive areas of a single floor or over multiple adjacent floors.
 - There was no evidence to suggest that the sprayed fire resistive material (SFRM) was damaged, except in the immediate vicinity of the debris impact on WTC 7 from the collapse of WTC 1. This is consistent with observations NIST made in the Deutsche Bank building that suffered similar debris damage from the collapse of WTC 2.
10. **Growth and Spread of Fires.** The fires that caused the collapse of WTC 7 were located on the lower floors where there was no gravity-fed tank to supply the automatic sprinkler system. Fires on Floors 11, 12, and 13 were more severe due to higher combustible loads (6.4 psf) than those on Floors 7, 8, and 9 (4 psf). By 3:00 p.m. to 4:00 p.m. (about two hours before the collapse of WTC 7), the fires were generally concentrated on the east and north sides around the northeast region.
 - The automatic sprinkler system on the lower floors of WTC 7 (below Floor 21) required direct water supply from the street level mains. The city water mains were unavailable to