

13th Floor

Like the fires on the 11th and 12th floors, fire on the 13th floor also moved counterclockwise. Fire was seen at about 2:30 p.m. on the east side of the floor. Somewhat later, smoke and flames were coming from windows across much of the east face. Around 3:41 p.m., the fire had turned the northeast corner and was one-fourth of the way across the north face. Soon after 4:00 p.m., flames had reached at least to the midpoint of the north face; and at 4:38 p.m., the fires to the east had died down to the point where they could no longer be observed. Around 5:00 p.m., there was intense burning to the west of the center of the north face. A couple of minutes prior to the collapse of the building at 5:20:52 p.m., flames jetted from windows in the same area, indicating that there had been fire toward the interior of the floor.

14th Floor

A fire was seen briefly on the north face of the 14th floor, about halfway between the midpoint and the northeast corner, at 5:03 p.m. No fire was evident in images taken a few minutes before and a few minutes after this time.

2.4 THE PROBABLE COLLAPSE SEQUENCE

The following is the NIST account of how the fires in WTC 7 most likely led to the building's collapse.

The collapse of WTC 1 damaged seven exterior columns, between Floors 7 and 17 of the south and west faces of WTC 7. It also ignited fires on at least 10 floors between Floors 7 and 30, and the fires burned out of control on Floors 7 to 9 and 11 to 13. Fires on these six floors grew and spread since they were not extinguished either by the automatic sprinkler system or by FDNY, because water was not available in WTC 7. Fires were generally concentrated on the east and north sides of the northeast region beginning at about 3 p.m. to 4 p.m.

As the fires progressed, some of the structural steel began to heat. According to the generally accepted test standard, ASTM E-119, one of the criteria for establishing the fire resistance rating for a steel column or floor beam is derived from the time at which, during a standard fire exposure, the average column temperature exceeds 538 °C (1000 °F) or the average floor beam temperature exceeds 593 °C (1100 °F). These are temperatures at which there is significant loss of steel strength and stiffness. Due to the effectiveness of the SFRM, the highest column temperatures in WTC 7 only reached an estimated 300 °C (570 °F), and only on the east side of the building did the floor beams reach or exceed about 600 °C (1100 °F). The heat from these uncontrolled fires caused thermal expansion of the steel beams on the lower floors of the east side of WTC 7, primarily at or below 400 °C (750 °F), damaging the floor framing on multiple floors.

The initiating local failure that began the probable WTC 7 collapse sequence was the buckling of Column 79. This buckling arose from a process that occurred at temperatures at or below approximately 400 °C (750 °F), which are well below the temperatures considered in current practice for determining fire resistance ratings associated with significant loss of steel strength. When steel (or any other metal) is heated, it expands. If thermal expansion in steel beams is resisted by columns or other steel members, forces develop in the structural members that can result in buckling of beams or failures of connections.