

6.15 FIRE IN AN UNDAMAGED TOWER

After incurring the direct damage from two different aircraft strike conditions, WTC 1 and WTC 2 stood for 102 min and 56 min, respectively. Structural models of the two aircraft-damaged buildings indicated that, in the absence of weakening by fires or other substantial insult, the buildings would have continued to stand indefinitely (NIST NCSTAR 1-6D). The application of the fire scenarios in Cases B and D to the aircraft-damaged towers resulted in collapse.

To complete the assessment of the relative roles of aircraft impact and ensuing fires, NIST examined whether an intense, conventional fire, occurring without the aircraft impact, could have led to the collapse of a WTC tower, were it in the same condition as it was prior to the aircraft impact on the morning of September 11, 2001. The characteristics of such an intense fire could have been:

- Ignition on a single floor by a small bomb or other explosion. If arson were involved, there might have been multiple small fires ignited on a few floors.
- Air supply initially determined by the building ventilation system.
- Moderate fire growth rate. In the case of arson, several gallons of an accelerant might have been applied to the building combustibles, igniting the equivalent of several workstations.
- Water supply to the sprinklers and standpipes maliciously compromised.
- Intact structural insulation and interior walls.

The four cases described in this report represented fires that were far more severe than this:

- The incident jet fuel created large and widespread early fires on several floors.
- The aircraft and subsequent fireballs created large open areas in the building exterior, through which air could flow to support the fires. In Case A, the fire was still limited by the total vent area (broken windows plus aircraft gash). In Case C, the fire had sufficient air. The fires in both cases were immense.
- About 10,000 gal of jet fuel were sprayed into multiple stories, simultaneously igniting hundreds of workstations.
- The impact and debris removed the insulation from a large number of structural elements that were then subjected to the heat from the fires.

In the four cases reported earlier in this chapter, none of the columns with intact insulation reached temperatures over 300 °C. Only a few isolated truss members with intact insulation were heated to temperatures over 400 °C in the WTC 1 simulations and to temperatures over 500 °C in the WTC 2 simulations.