

The fire simulation results for Case A and Case B were similar, indicating only a modest sensitivity to the fuel load and the degree of aircraft-generated damage. This was because, in general, the size and movement of the fires in WTC 1 were limited by the supply of air from the exterior windows. Since the window breakage pattern was not changed in Case B, the additional and re-distributed combustibles within the building did not contribute to a *larger* fire. The added fuel did slow the spread slightly because the fires were sustained longer in any given location.

Although there was generally reasonable agreement between the simulated and observed fire spread rates, there were instances where the fires burned too quickly and too near the windows. This resulted from an artifact of the model: the combustible vapors burned immediately upon mixing with the incoming oxygen.

Simulations performed with doubled fuel loads slowed the fire spread well below the observed rates. Combined with the above results, this suggested that the estimated overall combustible load of 4 lb/ft² was reasonable.

The simulations showed high temperatures in some of the elevator shafts. The late fire observed on the west face of the 104th floor may have started from fuel gases in the core shafts that had accumulated over the course of the first hour of fires below. The presence of fire in the shafts on the 99th floor provided some support for this hypothesis, but no simulations were performed for floors higher than the 99th.

The predictions of maximum temperatures (e.g., red zones in Figure 6–37) were consistent with those in the three-workstation fire tests.

The use of an “average” gas temperature was not a satisfactory means of assessing the thermal environment on floors this large and would also have led to large errors in the subsequent thermal and structural analyses. The heat transferred to the structural components was largely by means of thermal radiation, whose intensity is proportional to the fourth power of the gas temperature. At any given location, the duration of temperatures near 1,000 °C was about 15 min to 20 min. The rest of the time, the calculated temperatures were near 500 °C or below. To put this in perspective, the radiative intensity onto a truss surrounded by smoke-laden gases at 1,000 °C was approximately 7 times the value for gases at 500 °C.

WTC 2

Simulating the fires in WTC 2 posed challenges in addition to those encountered in simulating the fires in WTC 1. The aircraft, hitting the tower to the east of center, splintered much of the furnishings on the east side of the building and plowed them toward the northeast corner. Neither the impact study nor the validation experiments performed at NIST could be completely relied upon to predict the final distribution, condition, and burning behavior of the demolished furnishings. In addition, only the layouts of the 78th and 80th floors were available to the Investigation; the other floors were only roughly described by former occupants. As a result of these unknowns, the uncertainty in these calculations was distinctly greater than in those for WTC 1. To help mitigate gross differences between the simulations and the observables, NIST made floor-specific adjustments, based on the results of preliminary computations. In particular, the fuel load and volatility on the 80th floor were reduced, and the fuel load on the 81st and 82nd floors was increased.