

limited and people were infrequently observed. Numerous people were observed falling from the upper floors on the four faces of WTC 1, while the three people observed falling from WTC 2 came from a single window on the east side of the 79th floor. These differences suggested that conditions on the upper floors in WTC 2 did not degenerate as quickly, nor become as dire, as on the upper floors of WTC 1.

In WTC 1 a large number of streamers were observed falling from the tops of windows. These were attributed to smoldering polyurethane that was originally located above the window head casings. In contrast, very few streamers were observed for WTC 2. The absence of streamers is likely due to the relatively limited fire spread that occurred in WTC 2 and because large areas of the aluminum curtain wall that contained the polyurethane insulation were removed by the aircraft impact and resulting fireballs.

2.3.8 Other Structural Changes

There was extensive overt impact-derived structural damage to the perimeter columns and floor systems visible in the photographs and videos. The nature and extent of this damage, its implications for the post-impact stability of the tower, and its use in corroborating the simulations of the aircraft impact are discussed in NIST NCSTAR 1-2, NIST NCSTAR 1-3C, and NIST NCSTAR 1-6. There were also indications that, as the fires progressed, WTC 2 underwent a series of subtle structural changes. Presumably, these changes occurred as the structure adjusted to the initial damage inflicted by the aircraft and associated fireballs and the additional deformation caused by the fires that subsequently developed. Observations of these changes included:

- Hanging objects. Some of these appeared to have been locally dislodged floor slabs on the north face (80th, 81st, 82nd, and 83rd floors) and the east face (83rd floor) that had settled down to locations below the spandrel of the floor below. They were located where the fireballs had been ejected from the building under pressure. The hanging objects changed positions between the initial observation and the tower collapse. Since the windows were not always visible, the exact times of the localized changes could only be estimated.
- Molten metal, presuming aluminum alloys that melt at 475 °C to 635 °C, pouring from the tops of open windows. A major instance occurred on the north side of the 80th floor at 9:52 and lasted 7 min. The sudden appearance of the flow at the top of the window was likely the result of the formation of a pathway from the 81st floor, where the aluminum presumably had pooled on top of the floor slab as it melted. This, in turn, suggested that the 81st floor slab sank or pulled away from the spandrel at this time. At one point the flow shifted one window to the east, indicating that the 81st floor slab in the vicinity might have been shifting.
- Bowing of the outer steel framework. Images of the east face of WTC 2 reveal that the perimeter columns were distinctly bowed inward as early as 9:21 a.m. This bowing appeared to be largest near the center of the face and to disappear near the edges. The extent and expanse of the bowing is discussed in NIST NCSTAR 1-3C.