

- About 6 percent of the survivors described themselves as mobility impaired, with recent injury and chronic illness being the most common causes; few, however, required a wheelchair. Among the 118 decedents below the aircraft impact floors, investigators identified seven who were mobility impaired, but were unable to determine the mobility capability of the remaining 111.
- A principal factor limiting the loss of life was that the buildings were one-third to one-half occupied at the time of the attacks. NIST estimated that if the towers had been fully occupied with 20,000 occupants each, it would have taken just over 3 hours to evacuate the buildings using the stairs and about 14,000 people might have perished because the stairwell capacity would not have been sufficient to evacuate that many people in the available time. Egress capacity required by current building codes is determined by single floor calculations that are independent of building height and does not consider the time for full building evacuation.
- Due to the presence of assembly use spaces at the top of each tower that were designed to accommodate over 1,000 occupants per floor for the Windows on the World restaurant complex and the Top of the World observation deck, the New York City (NYC) Building Code would have required a minimum of four independent means of egress (stairs), one more than the three that were available in the buildings. Given the low occupancy level on September 11, 2001, NIST found that the issue of egress capacity from these places of assembly, or from elsewhere in the buildings, was not a significant factor on that day. It is conceivable that such a fourth stairwell, depending on its location and the effects of aircraft impact on its functional integrity, could have remained passable, allowing evacuation by an unknown number of additional occupants from above the floors of impact. Moreover, if the buildings had been filled to their capacity with 20,000 occupants, the required fourth stairway would likely have mitigated the insufficient egress capacity for conducting a full building evacuation within the available time.
- Evacuation was assisted by participation in fire drills within the previous year by two-thirds of survivors and perhaps hindered by a Local Law that prevented employers from *requiring* occupants to practice using the stairways. The stairways were not easily navigated in some locations due to their design, which included “transfer hallways” where evacuees had to traverse from one stairway to another location where the stairs continued. Additionally, many occupants were unprepared for the physical challenge of full building evacuation.
- The functional integrity and survivability of the stairwells was affected by the separation of the stairwells and the structural integrity of stairwell enclosures. In the impact region of WTC 1, the stairwell separation was the smallest over the building height—clustered well within the building core—and all stairwells were destroyed by the aircraft impact. By contrast, the separation of stairwells in the impact region of WTC 2 was the largest over the building height—located along different boundaries of the building core—and one of three stairwells remained passable after the aircraft impact. The shaft enclosures were fire rated but were not required to have structural integrity under typical accidental loads—there were numerous reports of stairwells obstructed by fallen debris from damaged enclosures.
- The active fire safety systems (sprinklers, smoke purge, fire alarms, and emergency occupant communications) were designed to meet or exceed current practice. However, with the