

ABSTRACT

This is the final report on the National Institute of Standards and Technology (NIST) investigation of the collapse of the World Trade Center (WTC) towers, conducted under the National Construction Safety Team Act. This report describes how the aircraft impacts and subsequent fires led to the collapse of the towers after terrorists flew jet fuel laden commercial airliners into the buildings; whether the fatalities were low or high, including an evaluation of the building evacuation and emergency response procedures; what procedures and practices were used in the design, construction, operation, and maintenance of the towers; and areas in current building and fire codes, standards, and practices that warrant revision. Extensive details are found in the 42 companion reports. The final report on the collapse of WTC 7 will appear in a separate report.

Also in this report is a description of how NIST reached its conclusions. NIST complemented in-house expertise with private sector technical experts; accumulated copious documents, photographs, and videos of the disaster; established baseline performance of the WTC towers; performed computer simulations of the behavior of each tower on September 11, 2001; combined the knowledge gained into a probable collapse sequence for each tower; conducted nearly 1,200 first-person interviews of building occupants and emergency responders; and analyzed the evacuation and emergency response operations in the two high-rise buildings.

The report concludes with a list of 30 recommendations for action in the areas of increased structural integrity, enhanced fire endurance of structures, new methods for fire resistant design of structures, enhanced active fire protection, improved building evacuation, improved emergency response, improved procedures and practices, and education and training.

Keywords: Aircraft impact, building evacuation, emergency response, fire safety, human behavior, structural collapse, tall buildings, wind engineering, World Trade Center.