

- Reconstruction of the gaseous thermal environment surrounding the buildings' structural elements and the resulting temperature rise within them.
- Generation and use of experimental data for assessing the accuracy of the prediction of thermal insult on structural members such as columns, trusses, beams, and other support structures like those in WTC 1, 2, and 7.

This document reports the likely nature of the fires in WTC 1 and WTC 2 and how NIST was able to reconstruct them. The outcome of the fire reconstructions became a principal input to the assessment of the collapse of the buildings. A reconstruction of the fires in WTC 7 is presented in a separate report.

E.2 PHOTOGRAPHIC EVIDENCE

The destruction of the WTC towers on September 11, 2001, may have been the most heavily photographed disaster in history. This was valuable to this Investigation, since neither of the buildings remained, eliminating access to the telltale signs that fire investigators typically use to assess the path and intensity of a fire. There was a good amount of photographic material shot during the early stage, when only WTC 1 was damaged. By the time WTC 2 was struck, the number of cameras and the diversity of locations had increased. Following the collapse of WTC 2, the amount of visual material decreased markedly as people rushed to escape the area and the huge dust clouds generated by the collapse obscured the site.

NIST assembled a collection of nearly 150 segments of video footage (totaling in excess of 300 hours) and over 7,000 photographs. The sources included television networks and stations, the New York City Police Department (NYPD), the Fire Department (FDNY) of the City of New York, and assorted World Wide Web sites. The collection included the work of over 200 photographers and 40 videographers. The material was organized into a database in which the searchable properties included the name and location of the photographer, time of shot/video, copyright status, content, whether it included the key events, whether it included FDNY or NYPD people or apparatus, and other details (falling debris, people, building damage).

To construct a time line for fire growth and structural changes in the WTC buildings, times of known accuracy were assigned to the photographic assets. The touchstone was the moment the second plane struck WTC 2, which NIST established from the clocks in the September 11 telecasts as 9:02:59 a.m. Absolute times were then assigned to all frames of videos that showed the second plane strike. By matching photographs and other videos to specific events in these initially assigned videos, NIST staff created a time line extending over the entire day with assigned relative accuracies of ± 3 s or better. The resulting timing of the five major events of September 11 is shown in Table E-1 below.

In each photograph and each video frame, each window was coded by whether fire and/or smoke were present and whether the window was still in place or not. Graphical rendering of these results, combined with timed sequencing of the actual photographic frames, led to the construction of highly detailed time lines for the spread of the fires and changes in visible damage to the buildings.