

Chapter 3

DERIVING THE PROBABLE COLLAPSE SEQUENCE

3.1 GATHERING OF EVIDENCE

Similar to the investigation into the collapse of the WTC towers, data for WTC 7 were collected from a number of sources and reviewed. Much of the information on WTC 7 was gathered and published during the reconstruction of the collapses of the towers. Comparison of the various building codes in use at the time of construction was the subject of NIST NCSTAR 1-1E. Details of the fire safety provisions and systems were published in NIST NCSTAR reports 1-1D, 1-1G, 1-1I, 1-4B, 1-4C, and 1-4D. The emergency power systems were described in NIST NCSTAR 1-1J. Properties of the structural steels used in the construction were the subject of NIST NCSTAR 1-3D and NIST NCSTAR 1-3E. The SFRM properties were presented in NCSTAR 1-6A. Much of the activities of the emergency responders was reported in NIST NCSTAR 1-8. A description of the collection and cataloguing of the photographic and videographic evidence appeared in NIST NCSTAR 1-5A. This included visuals of debris impact damage and fire spread subsequent to collapse of the WTC towers. Additional imagery was collected subsequent to the previously reported library. While not as plentiful as the imagery for the WTC towers, the cumulative WTC 7 evidence was sufficient to guide the reconstruction of the day's events.

As with the WTC towers, much of the information specific to the WTC 7 building construction was lost with the destruction of the WTC site. Nonetheless, copious information was obtained from drawings and specifications, reports, and available records from The Port Authority, Silverstein Properties, and a number of contractors that had worked on the design, construction, or modifications of WTC 7. The documents included erection and fabrication shop drawings of the building, which provided detailed information about the floor and column connections. Information and documents regarding the layout of the building interior were obtained from WTC 7 tenants. Staff of the occupying organizations and Silverstein Properties staff were also interviewed to gain additional insights into the layout, furnishing, and overall fuel loads. Additional interviews with emergency responders and building officials, along with tapes of radio transmissions from September 11, 2001, provided accounts of the human activity inside the building and around the WTC site.

3.2 THE LEADING HYPOTHESIS

Based on observations and analyses of photographic and video records, critical study of steel framing, and simplified and detailed analyses to investigate possible failure modes that could lead to an initiating event, NIST developed the following collapse hypothesis:

- The conditions that led to the collapse of WTC 7 arose from fires, perhaps combined with structural damage that followed the impact of debris from the collapse of WTC 1. The fires were fed by ordinary office combustibles.
- The fires on Floors 7 through 13 heated the building structure. Being lighter than the columns and with thinner SFRM, the floor beams, floor slabs, and connections heated more