

After the building was evacuated, signals from the Con Edison substation continued to be monitored off-site throughout the day on the supervisory control and data acquisition logs. One fire detector within the Con Edison substation went into alarm mode when WTC 1 collapsed, and stayed in the alarm mode until the substation was totally isolated from incoming feeders at 4:33 p.m. However, there were no other indications (e.g., no high temperature alarms from the transformers, no visible smoke emanating from the Con Edison building) that there were significant fires within the substations during that period of time. Logical sources of the fire detector alarm were the smoke and dust dispersed in the area of the substation from the collapse of WTC 1. While several transformers uncovered during site clean-up showed clear evidence of thermal damage, from the information gathered, NIST was unable to determine whether the thermal damage to the transformers occurred due to electrical overheating, due to a fire in the Con Edison substation, or due to burning within the rubble pile subsequent to the collapse of WTC 7. Based on this evidence, NIST concluded that fire within the Con Edison substation was not a factor in the collapse of WTC 7.

8.10 SUMMARY

The leading hypothesis for the initiation of the collapse of WTC 7 involved:

- Initial local fire-induced floor failures initiating in the tenant floors,
- At least one long unsupported column at the lower floors,
- Buckling of a critical column (the initiating event), which supported a large-span floor bay,
- An initial local failure that brought down the interior structure below the east penthouse, and
- Horizontal progression of the failure across the lower floors that resulted in a progressive collapse of the entire structure.

This hypothesis was supported by photographic and videographic evidence showing the collapse of the east section of the roof and the kinking of the east penthouse.

A critical look at the steel framing that supported the concrete floors in WTC 7 and, in general, the overall framing of the building, revealed several characteristics that warranted further consideration:

- Simple framing connections for girders,
- Long-span floor beams and girders,
- Asymmetric framing (one-sided lateral support to girders),
- Absence of shear studs, and
- Girder-to-column seat connections

Simple analyses revealed that, alone or in combination, these construction framing features had the potential to produce initial local fire-induced failures resulting from ordinary building contents fires on a tenant floor. The east side of WTC 7 had columns that supported large floor areas and many of the