

Consistent with the NYCBC, the WTC 7 HVAC systems were designed to incorporate a smoke purge mode, by which each floor of the building could be exhausted/purged of smoke manually on a floor-by-floor basis from the Fire Command Center, which was located on the 3rd floor of the building at the main lobby security desk. Two smoke exhaust fans were originally located within the building on the 6th floor and 47th floor. The return air ductwork was connected to the exhaust duct. Return air either dumped into the fan room via the return dampers in each branch duct or was exhausted via the smoke exhaust riser. A smoke exhaust damper would have opened at the shaft within each mechanical room, and the return dampers would have closed to exhaust smoke in the smoke purge mode. Curtain fire dampers were located throughout the building where ductwork crossed fire rated shaft walls, consistent with the NYCBC. Separate pneumatic smoke dampers were used in the fan room to direct airflow within HVAC ductwork.

During the early 1990s, Salomon Smith Barney (SSB) performed a major tenant retrofit to Floors 28 through 45. The retrofit included the combining of adjacent floors into single floors, the relocation of HVAC shafts, and the provision of new HVAC equipment to supplement base building equipment. This renovation included changes to the smoke management system, detailed in NIST NCSTAR 1-4D.

The building operations manual for WTC 7 specified three alarm modes pertaining to operation of the building HVAC systems. ALARM-1 initiated shutdown of HVAC equipment based on duct smoke detection. ALARM-2 initiated smoke purge on the affected floor. ALARM-3 specified the smoke purge sequence for non-affected floors. The smoke management sequence pertaining to the smoke purge function involved exhausting the fire floor and pressurizing the remaining floors with supply air.

Local Law #16 required that all buildings in occupancy group E (business), which included WTC 7, be provided a manual override capability for exhausting one floor at a time at a rate of six air changes per hour, or 1 cfm/ft² of floor area, whichever is greater. For WTC 7, with a footprint area of approximately 48 000 ft², this would require an exhaust capacity of at least 48,000 ft³/min (82,000 m³/h). The base building system serving the lower floors of the building provided a smoke exhaust capacity of 36,000 ft³/min (61,000 m³/h), which was not consistent with the minimum value specified by code. An 84,000 ft³/min (143,000 m³/h) exhaust fan was provided for the SSB floors during the tenant retrofit, which exceeded the capacity required by code.

WTC 7 was sprinklered throughout and was, therefore, exempted from the requirement for stair pressurization systems. The building was provided with a Class E fire alarm system consistent with the NYCBC, was provided with emergency power serving all emergency systems, and was equipped throughout with fire dampers at duct penetrations into vertical shafts, consistent with the NYCBC.

NIST found no documentation to indicate whether the smoke management system operated or did not operate on September 11, 2001. The following inferences indicate that it was unlikely that the system was in operation that day. First, as noted in Section 6.5.2, around 11:00 a.m., the stairways were filling with smoke, indicating that the smoke management system was not in use up till that time. Few people entered the building after that time. Second, at about 2:30 p.m., the decision was made to abandon the building (Section 6.6), so the system was not turned on after that. Third, in the NIST interviews with FDNY personnel, there was no mention of action to activate the smoke purge system. Fourth, none of the visual images showed smoke flowing from the exhaust louvers on Floors 6 and 47.