

and strobe lights); 150 miles of conduit; and 1,000 miles of wiring. Redundant Operations Control Centers were located in the basements of both towers.

The primary monitoring and control of the fire alarm system was performed at the FCD located in the lobby of each building. The new system included:

- Numerous interconnected microprocessors located in each of the four WTC buildings.
- Smoke sensors located throughout the tenant spaces, at each elevator landing, in return air ducts, and in electrical and mechanical rooms.
- At least one manual fire alarm station installed in each story in the evacuation path.
- Emergency voice and alarm speakers for notification and communication in all areas within the buildings, designed to ensure system function in the event 50 percent of the system became inoperable.
- Automatic notification of the fire department upon fire alarm activation.
- Two-way communications stations at the remote fire panels, at the Floor Warden stations, and at the standpipes.
- A two-way telephone system for the firefighters to make announcements.
- Emergency voice and alarm communication capability, both under manual control at the FCD.
- Strobe lights to provide alarm indications for the hearing impaired.
- Water flow indicators for the fire sprinkler system, including indicators for disabled systems.

No documentation of the status of the replacement system survived the 2001 attack. However, a 2002 analysis estimated that over 80 percent of the towers had been retrofitted and that about 25 percent of the original system was still in use.

Although there were localized carbon dioxide and halon systems within the towers, the Safety Plan predominantly relied on water for containing and suppressing a fire (Figure 5–2). By September 11, 2001, automatic sprinklers had been installed throughout WTC 1 and WTC 2.¹¹ The New York City water distribution system supplied water to the complex from two independent connections located under Liberty Street to the south and Vesey Street to the north. Within each tower were six 5,000 gal water storage tanks, three located on the 110th floor and one each on the 20th, 41st, and 75th floors. These were filled from the domestic water supply in the building. In the event of a fire, the gravity-fed water would flow to as many of the thousands of installed sprinklers as had been activated. The WTC engineering staff would supply additional water upward from the city mains using manually

¹¹ The exceptions to this were the computer rooms (protected with halon and carbon dioxide systems), kitchens (protected with dry chemical and steam smothering systems), mechanical spaces on the 108th through 110th floors, and the electrical rooms throughout the buildings, for which the application of water would have been inappropriate.