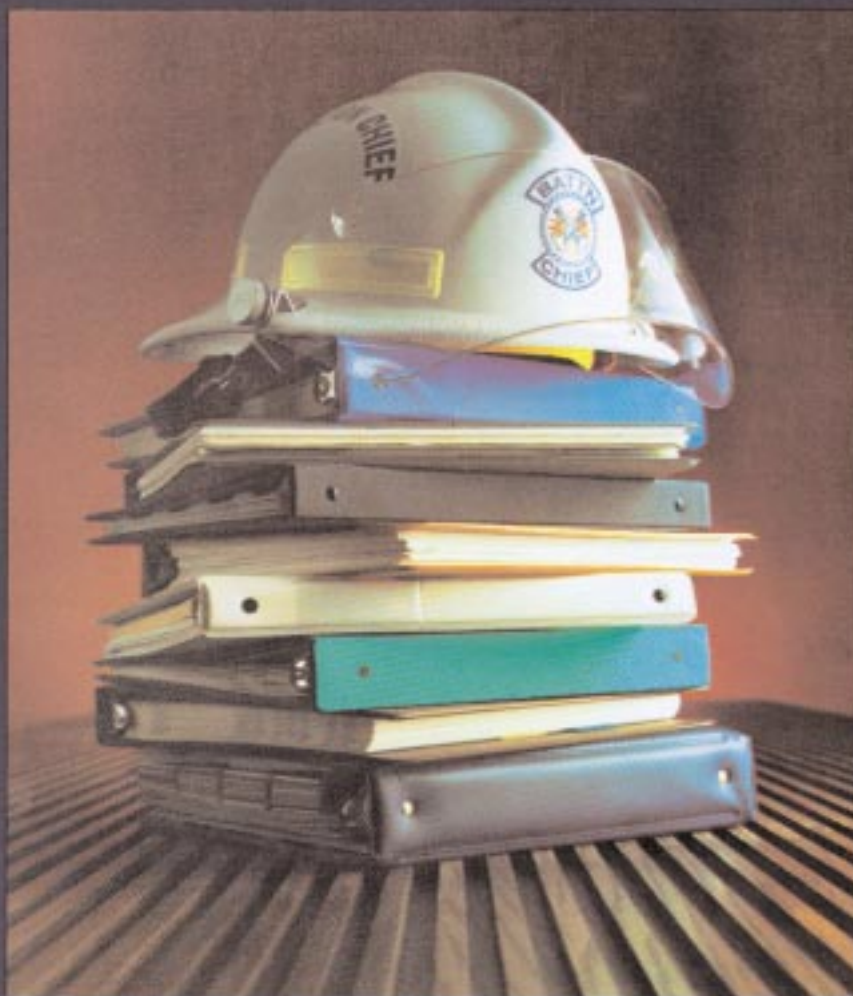


**FIRE CHIEFS**  
investigate, demonstrate and  
**SPEAK OUT**  
**ON FIRE SAFETY.**



A documentation of actual tests,  
demonstrations and results from segments of

**OPERATION SAN FRANCISCO**

sponsored by

**The International Association of Fire Chiefs**  
**San Francisco Fire Department • Marriott Corp.**

This report produced by

**Carlson**  
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# OPERATION SAN FRANCISCO

"Operation San Francisco," consisting of a series of fire tests conducted in San Francisco during the week of October 3-5, 1983, was supported in part by Carlton. Test room walls and ceilings contained Carlton's electrical non-metallic tubing (ENT™) carrying energized circuits. Each of the test hotel bedrooms and apartment rooms had a receptacle mounted in a nonmetallic outlet and switch box on one wall fed by electrical nonmetallic tubing. The hall separating the hotel bedrooms contained four ceiling fixtures supplied by energy through ENT run down the center of the hall ceiling above the ceiling board. An exit sign was placed at the end of the hall. The placement of the circuitry, receptacles, fixtures and sign is shown in Diagram I.

The wiring in the ballrooms was contained in electrical nonmetallic tubing, which ran in the ceiling above the walls, where it was dropped to the receptacles, four of which were in each ballroom. (See Diagram I).

The series of tests and the room conditions resulting from each test are described in the "Operation San Francisco Smoke / Sprinkler Test Technical Report." After the tests were completed, all electrical circuits were tested, examined and photographed. This demonstrated conclusively that the fire environment in no way affected the electrical raceway system. The circuits remained energized throughout and after the tests. The lights in the hallway and the exit sign continued to operate. The photographs of the raceways and boxes show no damage.

Of the 16 tests, three were allowed to go to flashover — in rooms 206, the blue exhibit area, and the apartment master bedroom. These are identified as tests 13, 14, and 16, respectively.

In these tests, the temperatures inside the rooms were in excess of 1200°F and are shown on graphs A, B and C as a function of time. Following the tests, the walls were opened to inspect the ENT and, in some cases, continuity checks were made of the circuits.

The series of after fire photographs show that no damage was done to the electrical systems in the walls or ceilings of the flashed over rooms. The photographs are numbered as shown below, and those numbers on Diagrams I and II indicate the location of the photographed boxes or tubing within the test structures:

Apartment Bedrooms	Photos #1, 2, 3 and 4 (Diagram II)
Hotel Room 206	Photos #5, 6 and 7 (Diagram II)
Blue Ballroom	Photos #8 and 9 (Diagram I)

These tests illustrate the ability of the concealed ENT to maintain physical integrity and circuit continuity in the walls or ceiling of the room after the room has gone through flashover.

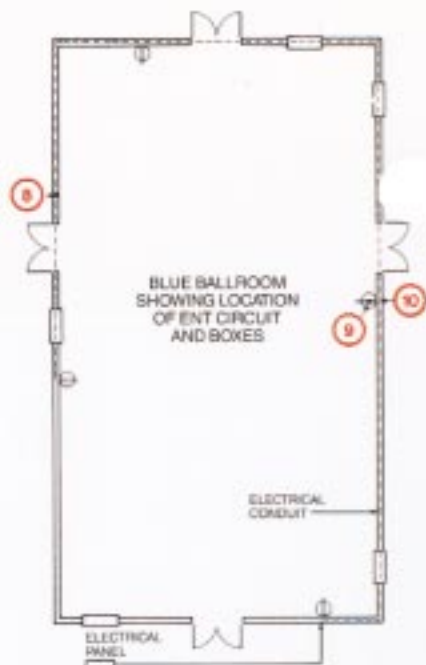
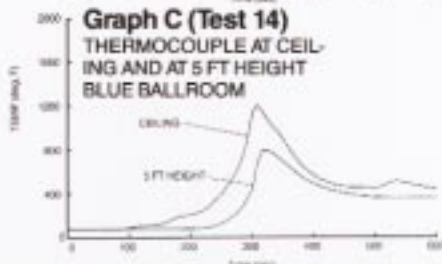
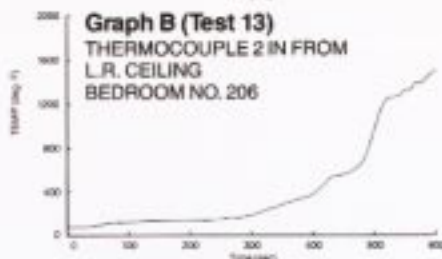
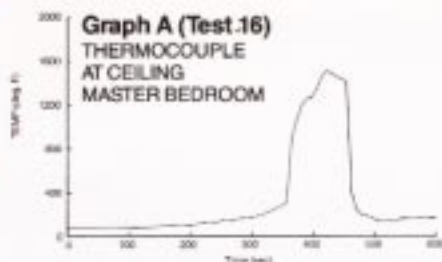
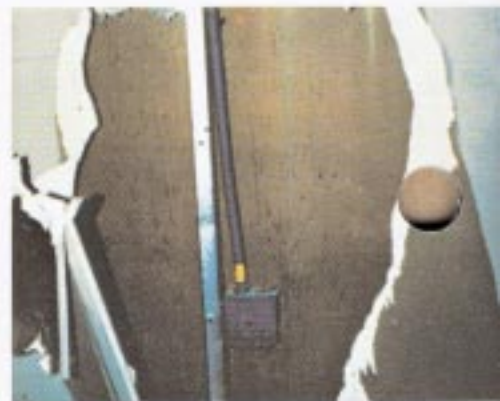


Diagram I



① This wall receptacle in the apartment master bedroom shows the extent of fire damage to bed frame, wall and outlet plate, while circuit operation is demonstrated by light. Recorded room temperatures are shown in Graph A. See Diagram II.



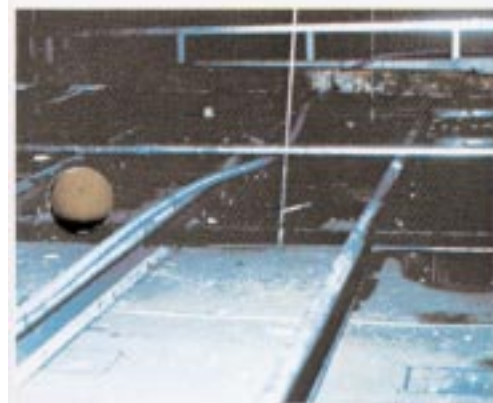
② This is the reverse side of photo #1 showing the reverse side of the wall receptacle and tubing, which are intact and undamaged. See Diagram II.



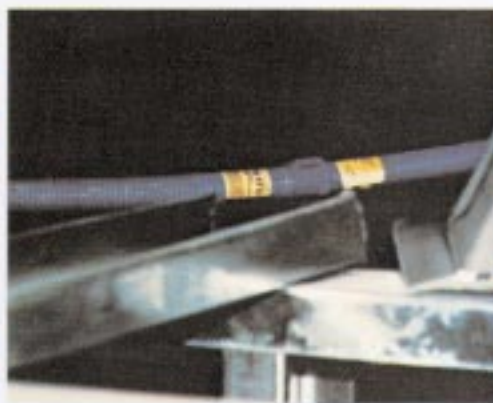
⑥ This receptacle is located in room 206 and is operative after flashover. Room temperatures during flashover shown in Graph B. See Diagram II.



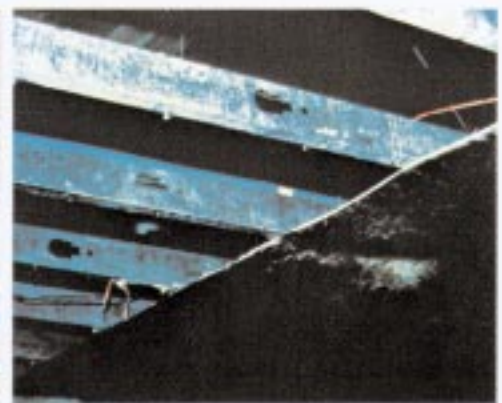
⑦ This photo shows same receptacle as photo 6, but the wall board was removed to show wiring and box intact. See Diagram II.



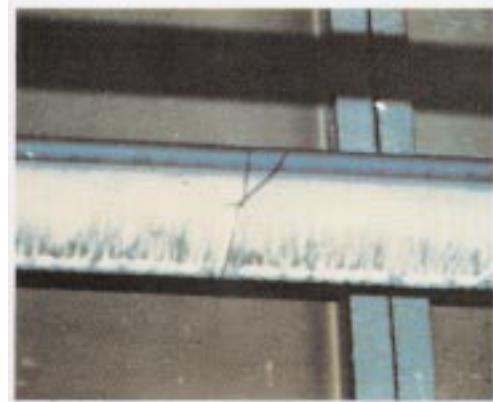
**3** Electrical nonmetallic tubing running across ceiling of apartment master bedroom showing effects of fire but tubing intact. See Diagram II.



**4** ENT™ running above apartment bedroom showing coupling for tubing. See Diagram II.



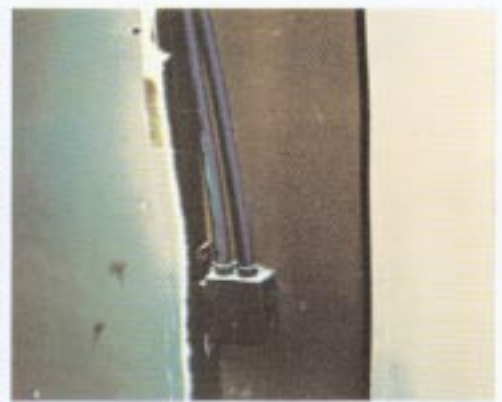
**5** The raceway in this photo is mounted above room 206. This room was one picked for a flashover fire on final day. See Diagram II and Graph B.



**6** Raceway secured to pipe above Blue Ballroom feeding four outlet and switch boxes in room. See Diagram I and Graph C.



**9** Outlet box in Blue Ballroom still functioning after final room burn (flashover). Temperatures are recorded in Graph C. See Diagram I.



**10** Outlet box shown in photo 9 from exterior of room with wall board cut away to show box and tubing still undamaged. See Diagram I.

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