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MUNICIPAL WATER SUPPLIES
LOMA PRIETA EARTHQUAKE
OCTOBER 17, 1989

The following are excerpts from a memorandum developed by the Public Utilities Commission reporting on the damage to the water and sewer systems caused by the Loma Prieta earthquake which occurred on October 17, 1989. This memorandum was intended to be submitted to the Board of Supervisors of the City and County of San Francisco. This material was taken from the Virtual Museum of the City of San Francisco website. The full text of the memorandum can be found at the following web address:

http://www.sfmuseum.net/quake/svww.html

> "At the direction of the Board of Supervisors [City of San Francisco], Mr. John Taylor, Clerk of the Board, forwarded a request from Supervisor Richard Hongisto for information on certain aspects of the City water supply. Specifically, the request is for information on (1) the safety of the water supply, (2) whether there has been any rupture of the City's sewer system near any collapse or rupture of the water system that could lead to contamination of the water supply, and (3) what steps are being taken or plans being recommended to correct any structural defects and strengthen the water system and sewer system. The nature of the inquiry reflects a concern for the safety of the water supply with respect to the protection of public health. Additional information on other aspects of the reliability of the water supply is included in the last section of this report."

> "A power failure on the peninsula affected the San Andreas filter plant operation for approximately one hour and forty minutes; however, the reservoir of treated water, located at the plant, provided continuity of service to northern San Mateo County and the City. City reservoirs were also unaffected and continued to function."

> "The City-wide power outages affected service to eight hilltop neighborhoods which are supplied by hydropneumatic pumping stations, rather than storage tanks or reservoirs. These neighborhoods of three to twelve city blocks, did not have full service until power was restored. The length of time that these stations were without power varied from 4 to 15 hours, depending upon their location. The possibility of any water quality-related impacts during those periods is minimal. The Water Department's capital improvement program for FY 1990-91 already contains a project for modifying these stations so that small portable generators can be easily connected in the event of power failures. "

"The greatest damage to the water system consisted of approximately 150 main breaks and service line leaks. Of the 102 main breaks, over 90 percent were in the Marina, Islais Creek and South of Market infirm areas. The significant loss of service occurred in the Marina area, where 67 main breaks and numerous service line leaks caused loss of pressure."

"They attempted to increase water pressure in the domestic water system by opening valves to let water flow into the mains in the Marina area from higher pressure zones. This action resulted in only a marginal increase in fire fighting pressures due to the extensive local damage to the distribution system."

"In areas of the City where leaks were small and isolated, and where it was not necessary to take the water mains out of service, the mains were left under pressure so that service and fire fighting capability were not disrupted."

"Given the degree of destruction in the Marina (the short block of Rico had 5 main breaks and 8 service leaks) it was necessary to pressurize and depressurize sections of pipe repeatedly until all leaks could be located and repaired. Initially. all service connections were closed to prevent loss of water pressure and damage to residences due to possible plumbing leaks internal to the buildings. CDD crews started by bringing perimeter mains back into service for fire protection. This work began the night of October 17 and continued until all service was restored to the Marina on October 21."

"On October 23, six days after the earthquake, service was restored to most of the Marina area and water quality test results indicated that water in that area was safe to drink."

"Several measures are being taken to strengthen the water system to minimize the likelihood of similar damage or to minimize the potential extent of damage."

"First, cast iron water mains are no longer being installed. New mains of up to 16 inches in diameter are made of ductile iron, and connections between pipe segments are now made with flexible joints that permit limited amounts of movement. Under a long-term capital program, older cast iron mains are being replaced with ductile iron pipe. In the Marina area, approximately 8,000 feet of cast iron mains will be selectively replaced as a result of the earthquake. These lines would have been scheduled for replacement at a future time, but work will be done now to mitigate the possibility of continued failures of these pipes. Distribution system pipes above 16 inches in diameter are made of welded steel, which is also less prone to damage than cast iron. The earthquake caused no damage to pipes greater than 16 inches in diameter."

"Third, the water distribution system is constructed with valves at intersections and interconnections so that problem areas can be isolated from the balance of the system. This feature serves to minimize the size of any area affected by a main break or service leak."

"Recommendations for redundant pipeline capacity or other safeguards will be sought."

"A study has been funded to evaluate the existing pipeline construction in the vicinity of known earthquake faults and to develop recommendations and criteria for more reliable pipeline designs in such areas. Funds have also been approved for initial studies of a second tunnel through the East Bay hills."

"Key Water Department facilities have been and continue to be fitted with standby power equipment."

Schulte & Associates' Conclusions:

The damage done to the municipal water distribution system serving the City of San Francisco as a result of the Loma Prieta earthquake appears to be relatively minor. Many of the breaks in the distribution system occurred in older portions of the system where cast iron piping was utilized. Replacing the cast iron piping with ductile iron piping and utilizing flexible joists should increase the reliability of the water distribution system to resist damage caused by seismic activity.

Based upon the above, it would appear that the municipal distribution system serving the City of San Francisco could generally be considered to be a reliable water supply source for sprinkler systems after a seismic event, with the exception of portions of the system where cast iron piping is utilized.

Speaking as a former member of the San Jose Fire Department (fire protection engineer, 1980-1982), the SJFD considered the municipal distribution system serving the City of San Jose to be a reliable water supply for sprinkler systems in the period between 1980 and 1982. The SJFD did not require a secondary water supply source for sprinkler systems protecting buildings (other than high rise buildings) based upon the lack of reliability of the municipal distribution system after a seismic event between 1980 and 1982.

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