

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

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Forwarded to:

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Director
Materials Transportation Bureau
Department of Transportation
Washington, D. C. 20590

SAFETY RECOMMENDATION(S)

P-78--50 and -51

At 2 p.m., e.d.t., on May 17, 1978, a Columbia Gas of Ohio, Inc., (gas company) construction crew, mistaking an 8-inch, low-pressure steel gas main for an 8-inch, high-pressure steel gas main, drilled a small pilot bit hole through the wall of the low-pressure gas main and began to cut into the pipe wall with a large diameter bit. The construction crew was making a "hot tap" to complete the final tie-in of an 8-inch, replacement gas main to the existing high-pressure system on the north side of Glessner Street in Mansfield, Ohio. The hot tap was to be made using a 3-way tapping tee which had its side outlet welded to the "live," high-pressure replacement gas main and its bottom outlet mistakenly welded to the low-pressure gas main. When the 1-inch pilot bit on the Williamson tapping machine attached to the top outlet of the tee penetrated the wall of the low-pressure gas main, gas at 42 psig pressure from the high-pressure gas system entered the 14-inch water column (w.c.) (approximately 1/2 psig pressure), low-pressure gas main and rapidly increased the pressure in the low-pressure system in a 4.8-square-mile area of Mansfield.

Shortly after 2 p.m., the Mansfield Fire Department began receiving reports of fires caused by excessively high appliance flames on gas appliances. A resident who lived near the construction site ran to the gas company crew and told them that the pilot light on her gas range had flared 2 feet and then had blown out. The gas company crew immediately shut off a nearby valve on the high-pressure gas system, which stopped the flow of gas from the high-pressure system to the low-pressure system.

At 2:06 p.m., the gas company dispatcher received a report that a large volume of gas was being vented from a building that housed a district regulator station, which was 3/4 mile from the construction site. The man dispatched to the station reported that the pressure had exceeded the low-pressure recording gauge which recorded pressures up to 30 inches w.c. (slightly over 1 psig). An oil seal pressure relief valve that had been set for 32 inches w.c. also had been overpressured

and was venting gas to the atmosphere through its 4-inch vent pipe. Seven other oil seal relief valves on district regulators within the 4.8-square-mile area also had been overpressured.

By 2:20 p.m., after being overpressured for 20 minutes, the low-pressure distribution system returned to its normal pressure of 14 inches w.c. Gas was physically shut off at approximately 2,000 meters or services out of the 12,300 meters in the 4.8-square-mile area. The shutoffs were made by firemen, police, gasmen, emergency response personnel, and residents. There were no fatalities or injuries requiring hospitalization because of this accident. Property damage to 16 houses resulted from the ignition of nearby combustibles by high pilot flames; 5 of these houses were extensively damaged.

On April 28, 1978, the gas company construction crew had abandoned and capped an old main at its connection to the 8-inch, high-pressure gas main on the north side of Glessner Avenue, on the east side of Arthur Street. At that excavation there were two 8 5/8-inch outside diameter (O.D.), coated, wrapped, and welded steel gas mains, which were identical in appearance. The high-pressure gas main was 3 feet north of and about 10 inches higher than the low-pressure gas main.

Before completing the final tie-in of the new replacement gas main to the existing 8-inch, high-pressure gas main on the west side of Arthur Street, the gas main atlas was consulted to verify the locations of the two gas mains. The atlas showed the 8-inch, high-pressure and low-pressure mains traversing Arthur Street parallel to each other. The small-scale--1 inch to 200 feet--gas main atlas did not indicate the depths of the mains or their locations from the lot line, nor did it show the mains crossing each other. However, investigations after the accident showed that the two mains crossed in the Arthur Street intersection.

In the excavation for the final tie-in west of Arthur Street, approximately 75 feet from the first excavation, the mains appeared to be in the same relative position (3 feet apart), but the north main was 4 inches lower than the south main, which made the tie-in more difficult. The construction crew welded an 8-inch, 3-way tapping tee to the top of the north main, which they presumed was the high-pressure main, and welded the side outlet of the tee to the newly installed high-pressure gas main. Next they pressure-tested the tee and new main successfully and then filled them with gas at 42 psig from the high-pressure system. This was done so that the pressure between the newly installed main would be the same as that in the main to be tapped so the steel chips from the pipe-tapping operation would not blow up into the tapping and plugging apparatus and clog it.

The gas company procedure manual acknowledges that it is important to recognize that operating maps may not be correct. The gas company's procedure for "By-Passing and Stopping Gas Flow " recommends that pressure gauges be installed to insure against losing pressure and customer outages. However, the tapping section of the procedure does not contain pressure gauge requirements and does not mention the possibility of overpressuring a low-pressure system.

Gas company procedures for "Main Tie-Ins" state that the specific tie-in plan, which includes the tapping operations, can be either written or oral. In this accident, the workmen were to follow an oral plan and did not consider that the high- and low-pressure gas mains could cross each other in Arthur Street between the two excavations. Consequently, a pressure gauge was not used to determine which line was the high-pressure gas main.

After the accident the first excavation east of Arthur Street was re-opened and a pipe locator was connected directly to the high-pressure main. This main was touching another pipe in Arthur Street and could not be traced electronically. The two pipes were excavated where they were touching and were electrically short-circuited; they were then separated. When traced with the pipe locator again, the high-pressure gas main was found to have crossed the low-pressure gas main with two 45° elbows in the Arthur Street intersection. The gas company records did not contain field measurements of where these lines crossed and, consequently, the gas main atlases did not show this crossing.

Title 49 CFR 192.627 requires that "Each tap made on a pipeline under pressure must be performed by a crew qualified to make hot taps." The 1976 ASME Guide covering this Federal code suggests that: "When the pipeline is exposed, it should be thoroughly examined to (a) verify the identity of the pipeline to be tapped by location, size, kind, type of coating, etc."

In this accident, the crew was qualified to make hot taps, but it was difficult to identify the correct pipeline because the two lines were identical. However, the Safety Board concludes that because of the similarity of the two gas mains, a pressure gauge tap should have been made to determine the exact location of the high-pressure main. If the construction crew had not immediately shut off the valve on the high-pressure gas main, and if the low-pressure system had not had the eight oil seal relief valves to relieve the high pressure, a catastrophic accident could have occurred.

The National Transportation Safety Board investigated and issued safety recommendations (P-74-24 and -25) on a similar accident in Greenwich, Connecticut, on May 25, 1977. In that accident, a gas company crew tapped a 3-inch casing pipe thinking it was the gas main, and severed the 2-inch gas main inside causing a massive gas escape.

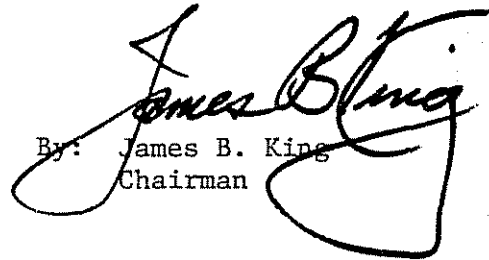
The leaking gas entered a building where it exploded and then burned, destroying three buildings, damaging one building, and injuring 10 persons. As in this accident, the gas company crew did not have accurate gas main atlases, and they did not positively identify the type, size, and pressure of the gas main to be worked on.

Therefore, the National Transportation Safety Board recommends that the Materials Transportation Bureau of the U.S. Department of Transportation:

Revise 49 CFR 192 to require that gas company system maps and records be maintained accurately to identify the location, size, and operating pressure of all of their pipelines. (Class III, Longer Term Action) (P-78-50)

Revise 49 CFR 192 to require that gas system operators verify through pressure monitoring or other means the identity of all pipelines before performing hot taps. (Class III, Longer Term Action) (P-78-51)

KING, Chairman, McADAMS, HOGUE, and DRIVER, Members, concurred in the above recommendations.


By: James B. King
Chairman