

P-177 AI-4

NATIONAL TRANSPORTATION SAFETY BOARD WASHINGTON, D.C.

ISSUED: May 13, 1981

Forwarded to:

Honorable Howard J. Dugoff
Administrator
Research and Special Programs
Administration
U.S. Department of Transportation
Washington, D.C. 20590

SAFETY RECOMMENDATION(S)

P-81-8 through -10

About 11:55 a.m., on October 9, 1980, a 2-inch-diameter compression coupling located on the upstream side of a gas meter set assembly in the boilerroom of the Simon Kenton High School in Independence, Kentucky, pulled out of its connection with a 2-inch-diameter gas service line. Natural gas at 165-psig pressure escaped through the 2-inch-diameter opening and, seconds later, exploded and burned. A basement wall was blown down, an adjacent classroom was damaged, and one student was killed. About 30 minutes later, a second explosion occurred, which injured 37 persons and extensively damaged the school. The gas service line was connected to a 4-inch-diameter gas main owned by the Union Light, Heat and Power Company (gas company), which was uprating the gas main by controlled pressure increases at the time of the accident. ^{1/}

The gas main's operating pressure was being increased from 60 psig to 200 psig in increments of approximately 35 psig. The gas main had many customer service lines connected to it. In preparation for the line uprating, the gas company's pressure crew, using microfiche customer connection records, had replaced the single regulators at the gas meter set assemblies on all of the known service line connections to the gas main with double-regulator systems as mandated by 49 CFR 192.195 to protect against accidental overpressure. The double regulators were designed to handle the anticipated 200-psig line test pressure; the single regulators were not. Because the gas company's records showed that the school's service line was connected to a 2-inch-diameter gas main that ran parallel and adjacent to the 4-inch-diameter gas main, the school's single regulator was not replaced.

When the pressure crew increased the gas main's pressure to 165 psig, the 2-inch-diameter compression coupling located on the upstream side of the school's gas meter set assembly disconnected from its lower nipple, allowing natural gas to be released at an initial pressure of 165 psig into the school's boilerroom. Approximately 5 seconds later, at about 11:55 a.m., the gas exploded, demolishing a wall that separated the boilerroom from a classroom. The cement blocks blown from this wall by the force of the explosion struck and fatally injured a student who was in the classroom. The teacher and the other students in the classroom escaped unharmed;

^{1/} For more detailed information read "Pipeline Accident Report—Union Light, Heat and Power Company, Natural Gas Explosion and Fire, Simon Kenton High School, Independence, Kentucky, October 9, 1980" (NTSB-PAR-81-1).

however, the classroom was heavily damaged by the explosion and an ensuing fire. About 12:25 p.m., another gas explosion occurred, injuring 37 persons, mostly firefighters. This explosion, described by witnesses as 10 times greater than the first explosion, damaged floors, doorways, and walls in the building.

The microfiche record that showed the service line was connected to the 2-inch-diameter gas main was incorrect. Once the information was entered into the computerized record, it apparently was not rechecked for accuracy. After this accident, five other buildings were found to be connected to a gas main other than the one shown by gas company records. The Safety Board believes that the gas company should develop a system for verifying its installations and recording them accurately in their records.

There were no drawings or records other than the microfiche record. Title 49 CFR Part 192 does not require gas companies to keep old records; however, the Materials Transportation Bureau (MTB) of the Research and Special Programs Administration of the U.S. Department of Transportation issued an Advance Notice of Proposed Rule Making (Docket No. PS-61) on November 20, 1979, concerning maps and records. The Safety Board commented that, although there are many reasons for the lack of accurate records, the MTB should require operators to maintain accurate records because of their safety, economic, and engineering importance. The Safety Board believes that the MTB should expedite the final rulemaking.

If an excess flow valve had been installed at the service line's connection with the gas main, or anywhere on the service line upstream of the gas meter set assembly, the severity of the first explosion may have been lessened and the second explosion may have been avoided. It is possible that the amount of gas escaping from a 240-foot-long, 3-inch-diameter service line under 165 psig pressure downstream from an excess flow valve could have provided enough fuel for an explosion, but not of the magnitude experienced. The second explosion, fueled by gas escaping for over 30 minutes, would not have occurred if an excess flow valve had been installed. The Safety Board pointed out the value of excess flow valves in a 1971 special study, "Effects of Delay in Shutting Down Failed Pipeline Systems and Methods of Providing Rapid Shutdown" (NTSB-PSS-71-1). The Safety Board also discussed this need in its accident reports of service line ruptures in Lake City, Minnesota, on October 30, 1972, 2/ and in New York City, on April 22, 1974. 3/ In both reports the Safety Board noted that the use of an excess flow valve might have shut off the flow of natural gas after the service lines were ruptured and the resultant explosions and loss of life and property might have been either averted or their severity reduced.

On May 16, 1973, the Safety Board recommended that the MTB undertake a study of fail-safe devices which will stop the flow of gas from ruptured lines. 4/ As a result of this recommendation, the MTB contracted for a study on the "Rapid Shutdown of Failed Pipeline Systems and Limiting of Pressure to Prevent Pipeline Failure Due to Over Pressure." The study, completed in October 1974, concluded that excess flow valves on high-pressure gas distribution systems would improve safety, that they are available and technically feasible, and that they are economically feasible. On April 19, 1976, the

2/ "Pipeline Accident Report--Northern States Power Company, Lake City, Minnesota, October 30, 1972" (NTSB-PAR-73-1).

3/ "Pipeline Accident Report--Consolidated Edison Company, Explosion at 305 East 45th Street, New York, New York, April 22, 1974" (NTSB-PAR-76-2).

4/ Safety Recommendation P-73-2.

Safety Board recommended that the MTB expedite its review of the study and determine what regulatory action was necessary concerning the use of excess flow valves. The MTB is still reviewing the matter to determine what regulatory action it may take.

The Safety Board has investigated 13 other pipeline accidents since 1972 in which automatic shutoff devices could have prevented the accident. As a result of these investigations, the Safety Board is conducting a "special study" titled "Excess Flow Valves in Gas Distribution Systems." The purpose of this special study is to collect and analyze sufficient data to characterize the conditions under which excess flow valves offer safety benefits at reasonable cost. It is expected that the study will be primarily concerned with the use of these devices in high-pressure gas distribution service lines, although their potential for use in low-pressure service lines may also be explored.

Notwithstanding the pendency of the foregoing study, the Safety Board believes that at least in the case of larger service lines on high-pressure systems (typically supplying schools, churches, and other places of public assembly) in which large quantities of gas could be released in a short time in the event of a service line rupture, the element of risk outweighs the countervailing considerations such as cost and maintenance problems which might be developed by the study as valid objections to universal installation of excess flow valves. Accordingly, the Safety Board believes that the MTB should initiate rulemaking on a priority basis to require the installation of excess flow valves on service lines to places of public assembly.

Title 49 CFR 192.615(a) requires that each operator establish written procedures to minimize hazards resulting from a gas pipeline emergency. Subsection 192.615(a)(b) requires that an emergency shutdown procedure be a part of these written procedures. The subject regulations were applicable to the uprating of the gas main, but the gas company did not have such written procedures.

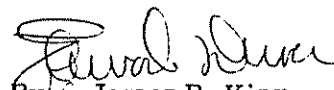
Therefore, the National Transportation Safety Board recommends that the Research and Special Programs Administration of the U.S. Department of Transportation:

Expedite final rulemaking on Docket No. PS-61 regarding the maintenance of maps and records, and include a provision for the retention of maps and records. (Class II, Priority Action) (P-81-8)

Initiate rulemaking to require the installation of excess flow valves on all newly installed or renewed high-pressure gas distribution system service lines with priority given to service lines supplying schools, churches, and other places of public assembly. (Class II, Priority Action) (P-81-9)

During routine annual inspection activities, verify gas company compliance with 49 CFR 192.615(a)(6), and enforce this regulation where it is needed. (Class II, Priority Action) (P-81-10)

KING, Chairman, DRIVER, Vice Chairman, and McADAMS and BURSLEY, Members, concurred in these recommendations. GOLDMAN, Member, concurred in all of the recommendations except for P-81-9.


By: James B. King
Chairman