

Log P-245

NATIONAL TRANSPORTATION SAFETY BOARD  
WASHINGTON, D.C.

ISSUED: April 9, 1984

Forwarded to:  
Mr. J. J. Bacon  
President  
Boston Gas Company  
One Beacon Street  
Boston, Massachusetts 02108

SAFETY RECOMMENDATION(S)  
P-84-7 through -9

At 2:50 a.m., on September 23, 1983, the Boston Water and Sewer Commission received a telephone call from the Boston Police Department notifying it of a broken water main and flooding at the intersection of Porter and Bremen Steets in East Boston, Massachusetts. Earlier that evening a 12-inch-diameter water main had split and flooded the street; water already stood several inches above the curb line when the commission was notified.

About 2:59 a.m., gas pressure in the Boston Gas Company's (gas company) distribution system in East Boston rapidly increased from 7 inches water column (W.C.) (about 0.25 psig) to more than 16 inches W.C. (about 0.6 psig), as indicated by a recording pressure gauge located at Eagle Square in East Boston. (The pen on the recording gauge was moved off the chart by the pressure increase; maximum pressure recorded by the chart was 15 inches W.C., but the pen inked beyond that point.) Gas pressure at this location was telemetered to the gas company's dispatch center at Commercial Point where it activated an alarm.

At 3 a.m., the gas company's Rivermoor Operating Center received a telephone call concerning a high pilot light on a gas range in a house in East Boston, and at 3:23 a.m., a gas company serviceman responded and shut off the gas at the meter. About 3:20 a.m., a gas company emergency truck was dispatched to the corner of Porter and Chelsea Streets in East Boston, where the broken water main was flooding the area. Once on site, the emergency truck crew noticed much commotion as many people left buildings and residences throughout the area.

The Boston Fire Department (fire department) began receiving telephone calls about gas odors, high pilot lights, and fires about 3:07 a.m., and more than 200 similar telephone calls were recorded by the fire department from that time until 10 a.m. The calls came from residents in 60 streets in East Boston. On-scene requests for aid from fire department personnel indicated that the number of affected residences was much greater than the number of requests recorded by the fire department. In all, 200 firefighters, 25 engine companies, and 118 ladder companies responded. The firefighters encountered high flames in gas appliances in some houses and strong gas odors in other houses where the gas pilot lights had blown out. At these locations the firefighters shut off the gas supply at the meters. Seven structural fires—three major fires involving heavy damage and four less serious fires—were extinguished during this period. At 3:52 a.m., a restaurant exploded and was destroyed. Police and fire department personnel began evacuating residents from their homes in fear of additional explosions or fires.

Gas company crews searching for the source of the high gas pressure found the district regulator vault at Bremen and Porter Streets (one of four district regulators in the East Boston area) had been submerged in water. The water had completely filled the primary regulator vault. The water also had filled the monitor regulator vault to a depth of 12 inches. Each regulator is located in a separate underground concrete vault about 6 feet long by 6 feet wide by 6 feet deep; no pumps or drains were installed in the vaults. Entrance to the vaults, which are spaced about 15 feet apart, is through two 36-inch-diameter, round, cast-iron covers.

Gas pressure entering the distribution system at Bremen and Porter Streets is regulated by a primary regulator (an 8-inch Rockwell Model 014) set to control the pressure to a maximum of 7 inches W.C. If the primary regulator should fail for any reason, the pressure in the distribution system would begin to rise above the 7-inch W.C. where it would hold the control point. The monitoring regulator would "take over" when the distribution system pressure reached 12 inches W.C., where it holds the pressure if it is working properly.

After the vault had been pumped out, inspection of the primary regulator at Bremen and Porter Streets showed that water had entered the regulator through leaks in a gasket and through the vent piping, that water had filled the area above the regulator diaphragm, and that the weight of this water in the diaphragm had held the regulator valve open, thereby allowing the gas pressure to increase in the distribution system. A 1-psig air pressure test on the vent piping and the regulator was unsuccessful; air leaked out of the regulator gasket and the vent piping at the control regulator. The vent piping and the regulator gasket were supposed to be watertight and capable of operating submerged in water in a completely flooded vault. The gasket when removed did not appear to be crimped or broken. Inspection of the monitoring regulator revealed that six, 6-inch-diameter, 1/8-inch-thick weights had been placed unsecured on the diaphragm plate to balance the regulator at 12 inches W.C. These weights were also oversized and extended beyond the edge of the upper case, whereby they physically blocked the travel of the diaphragm when it began to operate the valve to maintain pressure at 12 inches W.C. in the distribution system. Because these weights blocked the diaphragm travel, the monitoring regulator could not close completely, and it would have been possible for gas at up to 8 psig to enter the distribution system.

At 3:50 a.m., the pressure in the gas supply to the four East Boston district regulators was reduced from 8 psig to 4 psig. At 4:45 a.m., a valve was closed at Bremen and Porter Streets, isolating the regulators from the rest of the distribution system; and at 5 a.m, pressure had been reduced to 8 inches W.C., which was within the normal operating pressure range. By 9 a.m. the water in the Bremen and Porter Streets vaults had been pumped out, and the monitoring and primary regulators were inspected.

This district regulator station is required by Federal regulations to be inspected annually. Title 49 of the Code of Federal Regulations for the transportation of natural and other gas by pipeline, Part 192.739, Pressure limiting and regulating stations: Inspection and testing states:

Each pressure limiting station, relief device (except rupture discs), and pressure regulating station and its equipment must be subjected, at intervals not exceeding one year, to inspections and tests to determine that it is:

- (a) In good mechanical condition;
- (b) Adequate from the standpoint of capacity and reliability of operation for the service in which it is employed;
- (c) Set to function at the correct pressure; and
- (d) Properly installed and protected from dirt, liquids, or other conditions that might prevent proper operation.

The district regulator station and the monitor regulator at Bremen and Porter Streets had had an annual inspection on May 19, 1983; no problems were indicated at that time.

A recording pressure gauge located in a locked box on a standpipe adjacent to the Bremen and Porter regulator station was inspected later to determine the time of overpressure and the amount of the overpressure. This 7-day pressure chart, which normally is rotated by a clock mechanism, was found on September 20, 1983, to be loose and not turning. In addition, the pen designed to ink the pressure variations on the chart was found to be inoperable; the chart was blank. This condition had been reported by the pressure crew when they went to change the chart, but no date had been set for the repairs, although new pens had been ordered. The pressure recording charts at the other three regulator stations were all recording correctly, although the time on one chart was off by 15 minutes.

The Safety Board believes that all gas distribution companies have a responsibility to insure that the crucial components of their distribution systems have been inspected and tested and are operating correctly so that similar overpressure conditions do not occur.

Therefore, the National Transportation Safety Board recommends that the Boston Gas Company:

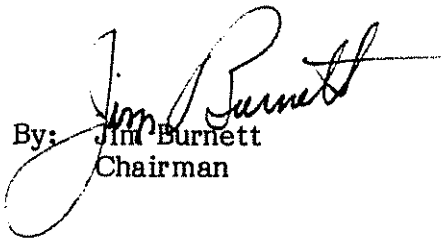
Inspect all primary and monitoring regulators in its gas distribution system to verify that the regulator gaskets are correctly installed and that the vent piping is watertight. (Class II, Priority Action) (P-84-7)

Secure the balance weights on the diaphragm plate on all regulators that use balance weights. (Class II, Priority Action) (P-84-8)

Repair as necessary and maintain existing pressure recording equipment to record correctly the operating conditions of the gas distribution system. (Class II, Priority Action) (P-84-9)

The National Transportation Safety Board is an independent Federal agency with the statutory responsibility ". . . to promote transportation safety by conducting independent accident investigations and by formulating safety improvement recommendations" (Public Law 93-633). The Safety Board is vitally interested in any actions taken as a result of its safety recommendations and would appreciate a response from you regarding action taken or contemplated with respect to the recommendations in this letter.

BURNETT, Chairman, GOLDMAN, Vice Chairman, and GROSE, Member, concurred in these recommendations. BURSLEY and ENGEN, Members, did not participate.

By:   
Jim Burnett  
Chairman