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NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

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Forwarded to:

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President and Chief Executive Officer
National Fuel Gas Company
10 Lafayette Square
Buffalo, New York 14203

SAFETY RECOMMENDATION(S)

P-85-23 through -28

At 2:40 a.m., on February 22, 1985, a police patrolman on routine patrol smelled strong natural gas odors as he crossed railroad tracks while heading south on North Sixth Street in Sharpsville, Pennsylvania. He radioed this information to the Sharpsville Police Department dispatcher at 2:42 a.m.; the dispatcher relayed the information to the National Fuel Gas Company (gas company) by telephone at 2:43 a.m., and a gas serviceman was ordered to the scene. At 3:15 a.m., before the serviceman arrived at the site of the reported leak, the Sharpsville Inn and a connecting building exploded and burned, killing two persons. Firefighters arriving on scene moments later encountered a second, smaller explosion which injured one firefighter. Gas company personnel shut off the gas to the leak site at 4:15 a.m. 1/

Thirty-five minutes elapsed between the time of the discovery of escaping gas at 2:40 a.m. until the explosion at 3:15 a.m. During that period the gas company promptly alerted and dispatched a serviceman to the site but, as in many similar accidents, the serviceman lived some distance from the leak site, had to get dressed and drive to the gas company offices to get a truck and equipment, and then had to drive to the accident site. In this accident the serviceman arrived at the accident site about 3:25 a.m., about 30 minutes after he was notified, but 10 minutes after the first explosion. This 30-minute response time was reasonable under the circumstances.

The gas company should have suspected the severity of the gas leak when it received an additional call about a strong gas odor from the resident at 13 Fifth Street after receiving the first report from the police dispatcher about a strong gas odor and a possible gas main break. The gas company dispatcher should have requested the assistance of the police and fire departments in ventilating and evacuating the buildings in the immediate area of the leak. The patrolman requested persons in one building to evacuate, but a request from the gas company for additional assistance might have initiated additional ventilation and evacuation efforts. A request for assistance by the gas company might have prompted the patrolman to enter the Sharpsville Inn to ventilate it, where he would have found the two people inside. Moreover, the gas company's instructions to its dispatchers, which led to the resident at 13 Fifth Street not being told to vacate her building in the face of not only her report of a strong gas odor but also reports of a strong gas odor throughout the area by the police dispatcher, were inappropriate.

1/ For more detailed information, read Pipeline Accident Report—"National Fuel Gas Company, Natural Gas Explosion and Fire, Sharpsville, Pennsylvania, February 22, 1985" (NTSB/PAR-85/02).

The serviceman who first arrived at the site had not been trained by the gas company regarding specific actions to be taken during gas leak emergencies. Although it was too late in this case to do anything about the demolished buildings and the two fatalities, the serviceman did not begin immediately to alert or to evacuate people residing in the immediate area or to ventilate any of the area buildings. These actions were not taken until later when a gas company emergency crew arrived. Since gas companies must rely heavily on employees who are called out for emergencies, particularly at night, they should be given in-depth training in emergency procedures and in working and coordinating with local police and fire departments.

Since 1972 the Safety Board has investigated more than 19 gas distribution pipeline accidents, which involved 35 fatalities and 33 injuries and in which a request for assistance from the local emergency response agencies by the gas companies might have prevented many of the fatalities and injuries. Moreover, because the Board investigates only a small portion of the more than 1,200 gas distribution accidents reported annually (only those accidents involving a fatality or substantial property damage are investigated by the Board), the full effect of improved early notification by gas companies to local emergency response agencies cannot be assessed. The problem is not that gas companies are slow to respond, but that most gas companies have a limited initial response capability, particularly for nighttime incidents. Under normal conditions the gas company dispatcher, once informed of a leak or gas odor, must first verify it, make a determination of its severity, and call the serviceman; all of which takes time. In turn, the serviceman must drive to the problem area and begin his investigation, all of which takes still more time. From the point of view of public safety, it is important that the gas company dispatcher inform the local fire and police departments of the leak or gas odor reported and request that they make an immediate inspection of the affected area, determine the degree of hazard (and here the dispatcher can advise them), and make a decision to evacuate buildings, ventilate buildings, or monitor the area until the gas company serviceman arrives, thus saving much valuable time. When dealing with the possibility of deaths or injuries (not to mention property damage), it is far better to overreact on the side of public safety.

Company maps showed that there was a 6-inch-diameter, high-pressure, polyethylene plastic gas main under North Sixth Street at the railroad track crossing and also that there was a 3-inch-diameter, low-pressure, steel gas main on the east side of the larger main. After the area was checked and found to be free of gas and after the relighting process was begun, a gas company crew began to excavate in North Sixth Street south of the railroad tracks where the blowing gas had been observed. The plastic gas main was uncovered. A coupling used to join the lengths of plastic pipe was located 37 inches south of the open end of an 8-inch-diameter steel casing pipe in which the 6-inch-diameter plastic gas main was installed under the railroad tracks. The plastic pipe had pulled 3/4 inch out of the north end of the coupling.

The patrolman first smelled the strong gas odor at 2:40 a.m., and the explosion occurred at 3:15 a.m. The pressure recording chart located at North Sixth and Main Streets that recorded the gas pressure on the plastic gas main showed a sudden, sharp pressure drop from 49 psig to 25 psig beginning at 3:45 a.m. and a rapid pressure rise at 5:30 a.m. The gas company had placed the chart on the clock drive at 10:30 a.m. on February 17, 1985, but the first ink mark on the chart was made at 11 a.m. on February 17, 1985; obviously, the pen had not been placed in the chart at the correct time. The 30-minute fast setting (11 a.m. vice 10:30 a.m.) does not explain the time difference on the chart, because such a difference would place the time of the pullout at the time of the explosion, 3:15 a.m. (3:45 minus 30 minutes).

When the valve on the failed plastic gas main was turned off at 4:15 a.m., the flow of gas into the failed section was stopped. That valve closure also restored pressure to the rest of the system almost immediately and would have led to a rapid pressure rise. Therefore, the rapid pressure rise, depicted on the chart at 5:30 a.m. actually occurred at 4:15 a.m. Thus, the chart time was fast by 1 hour 15 minutes. By subtracting 1 hour 15 minutes from the recorded time of the rapid pressure drop (first indicated about 3:40 a.m.), the time of the pullout can be established at 2:25 a.m., 15 minutes before the gas odor was detected by the patrolman and 50 minutes before the explosion at the Sharpville Inn.

If the recorded pressure chart information or a low pressure alarm had been transmitted to one of the gas company offices staffed 24 hours a day (preferably the dispatcher office), the alarm not only would have alerted the gas company to the leak but the sudden, rapid 25-psig pressure drop in a 50-psig pressure system also would have indicated a major leak. A proper assessment of this information would have given the gas company an additional 18 minutes (from the time of the pullout at 2:25 a.m. to the time of the first telephonic notification at 2:43 a.m.) during which company personnel could have been notified and dispatched and the police and fire departments could have been requested to evacuate the area and ventilate the buildings. If this had been done, it is possible that the explosions would not have occurred or at least that the fatalities and injuries would not have resulted. The Safety Board advocates the transmission of gas pressure readings to continuously staffed gas company offices where trained personnel can monitor the information for rapid leak detection and can provide a timely response by gas company personnel.

The Dresser 700 "posi-hold" coupling involved in this accident was manufactured in 1975 through 1978 in 2-, 3-, 4-, and 6-inch diameters and employed a plain roller-grip gasket in each end. The 6-inch-diameter, 7-inch-long coupling involved in this accident was intended for joining steel piping or plastic piping interchangeably when installed in accordance with the manufacturer's installation instructions and product ratings. The Dresser 700 "posi-hold" couplings were sold only to the Columbia Gas Company (Columbia Gas) and to National Fuel. A total of 4,389 2-inch-diameter couplings, 5,553 3-inch-diameter couplings, 6,629 4-inch-diameter couplings, and 821 6-inch-diameter couplings were sold to these two companies. The couplings were not designed to restrain plastic pipe until the pipe failed; the coupling involved in this accident was rated to restrain plastic pipe up to 2,700 pounds of tensile force (pull).

Dresser salespersons did not have occasion to point out the fact that the coupling had limitations, because they did not solicit the sale of the couplings to any company other than Columbia Gas. National Fuel bought these couplings directly as a result of talking with Columbia Gas, because it also saw the advantage of using one type of coupling to eliminate the possibility of an error in selecting the correct coupling to join different types of pipe. Dresser's advertisement that its "joint will restrain pullout until the pipe fails outside the coupling" applied only to one style of coupling and not to the 700 "posi-hold" coupling with plain roller-grip gaskets involved in this accident. National Fuel should have been concerned about the stresses caused by contraction in the plastic pipe and should have made the appropriate calculations. The gas company could have requested information about the limitations of the coupling from Dresser's Technical Services Department; it did not avail itself of this service. In turn, had Dresser's sales organization been made aware of the sale of the coupling to National Fuel, it is likely, given Dresser's practices, that Dresser would have contacted the gas company to describe the coupling's capabilities and limitations.

The gas company engineering department never calculated the contraction forces which would be caused by predictable temperature drops in the area where the plastic pipe was to be installed. Moreover, it did not calculate the forces or potential forces that would be exerted on the coupling; it assumed that the coupling would hold the pipe against all forces, and as a result, the gas company installed 1,500 feet of 6-inch-diameter plastic pipe with five couplings that it assumed would hold so long as the forces did not exceed the rating of the pipe. However, the contraction forces of the plastic pipe exceeded the restraining force of the coupling, and a pullout resulted.

In an era when the use of plastic pipe is expanding rapidly in the gas distribution industry, it is imperative that gas companies become completely familiar with the forces that act upon pipe and the limitations of using couplings with the pipe. Company engineers must consider these factors carefully in their design calculations.

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

Immediately institute a program to train its dispatchers periodically in the use of civil agencies to alert residents, to ventilate buildings, and to evacuate buildings in leak areas pending the arrival of responding gas company personnel. (Class II, Priority Action) (P-85-23)

Train its dispatchers and issue guidelines emphasizing the importance of determining the severity of a gas leak at the earliest possible time. (Class II, Priority Action) (P-85-24)

Include in its training program for its emergency response personnel procedures for contacting, coordinating, and cooperating with local emergency response agencies in communities served by the gas company. (Class II, Priority Action) (P-85-25)

Install pressure transmission or alarm equipment at strategic pressure-recording points to alert dispatchers promptly to emergency conditions as evidenced by abnormal pressures. (Class II, Priority Action) (P-85-26)


Instruct its engineering department to calculate prior to installation all of the forces anticipated to act upon a gas main and to compare the forces with the design limitations of couplings and other fittings to be used in the installation to ensure that the limitations are not exceeded. (Class II, Priority Action) (P-85-27)

Conduct a systemwide survey to identify any other locations where the 6-inch-diameter 700 "posi-hold" couplings with plain roller-grip gaskets were installed on plastic pipe, inspect those locations for indications of pipe pullout, and replace the couplings or anchor the pipe as required. (Class II, Priority Action) (P-85-28)

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. Please refer to Safety Recommendations P-85-23 through -28 in your reply.

BURNETT, Chairman, GOLDMAN, Vice Chairman, and BURSLEY, Member, concurred in these recommendations.


By: Jim Burnett
Chairman