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NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

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Forwarded to:

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SAFETY RECOMMENDATION(S)

P-85-31

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 Sharpville, Pennsylvania. He radioed this information to the Sharpville 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, a tavern 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/

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. 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 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).

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

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 6-inch-diameter, Dupont Aldyl "A" polyethylene 2306 SDR11.5 plastic pipe involved in this accident has a coefficient of expansion/contraction about seven times that of steel pipe, i.e., for each 1 inch that a steel pipe contracts, this plastic pipe would contract 7 inches under the same conditions. Moreover, for every 10° F temperature drop this plastic pipe would contract 1.08 inch per 100-foot length, or 16.2 inches over the entire 1,500-foot length of this pipeline, if unrestrained by soil or other forces. 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. Also, coupling and plastic pipe suppliers should make available to gas companies the full range of information on their products' limitations, as well as their products' virtues, so that there will be no question of what the products can and cannot do. The availability of information about product capabilities and product limitations becomes even more important as product changes and innovations are made by the supplier. The new information must be made available promptly to the ultimate user, and the user must install the product only after careful consideration of its capability.

In this case the new coupling's limitation (the fact that it might pull out before pipe failure) should have been evaluated fully by the gas company; the gas company also should have calculated the forces of contraction on the plastic pipe to determine if the pipe would need anchoring to prevent pullout. The calculation was not made; the gas company apparently concluded--based on Dresser's statement related to another line of couplings--that this coupling would hold until the pipe failed.

The Safety Board investigated seven gas distribution pipeline accidents between 1976 and 1985 in which plastic pipe pulled out of its coupling because either the coupling used was incorrect (nonrestraining) or the gas company did not know, or inquire how much plastic pipe could contract, or both. As a result of these accidents, the Safety Board urged gas industry and plastic pipe industry trade associations that could play an effective role in preventing a recurrence of similar accidents to disseminate information to their member companies about new products, to include both the products' limitations as well as their capabilities.

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

Issue an advisory bulletin to alert gas distribution pipeline operators who use plastic pipe and couplings to establish that the forces anticipated to act upon the installation are within the design limitations specified by the manufacturer. (Class II, Priority Action) (P-85-31)

BURNETT, Chairman, GOLDMAN, Vice Chairman, and BURSLEY, Member, concurred in this recommendation.

By: 
Jim Burnett
Chairman