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National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: July 8, 1986

In reply refer to: P-86-14

Mr. G. A. Lawrence
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American Gas Association
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About 2:05 a.m. on February 21, 1986, natural gas at about 987 psig ruptured a 30-inch-diameter pipeline, tore about 480 feet of pipe out of the ground, exposed about 40 feet of an adjacent parallel pipeline, and ignited. The fire destroyed two houses, one house trailer, and six automobiles, and damaged other buildings near State Route (SR) 52, near Lancaster, Kentucky. Three persons were injured, two seriously. Seventy-seven persons were evacuated from the area. Valves were closed at 2:16 a.m. at a compressor station located 7 miles away and crossover valves were closed at 2:46 a.m., isolating the ruptured pipe within an 18-mile section. Gas-fed fires burned out at 3:14 a.m., and the evacuated persons were allowed to return to their homes the next day.

After the area had cooled, Safety Board investigators measured, photographed, and analyzed the torn sections of pipe. The rupture originated near the center of a 27-inch-long by 10-inch-wide oval-shaped corroded area of the pipe; the maximum thickness of the remaining pipe wall measured 140 mils. The nominal thickness of the pipe wall when it was originally installed in 1957 was 375 mils. The origin of the pipe rupture was located about 30 feet south of the pipe casing under State Route 52 in an area of a rocky chert-and-clay formation.

The gas transmission pipeline which failed was one of three parallel pipelines owned and operated by the Texas Eastern Gas Pipeline Company (TETCO). The area of failure was a rural, DOT Class 1 location.

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As a result of the rupture of TETCO's No. 10 pipeline on April 27, 1985, near Beaumont, Kentucky, all three TETCO gas transmission pipelines within the State of Kentucky were inspected using an in-line pipeline inspection tool. Thirty-five sections of pipe were removed and replaced because of corrosion. Corrosion of the area of the pipeline which ruptured on February 21, 1986, had been identified on September 12 1985, through use of the in-line inspection tool; however, the corroded segment was neither replaced nor the pressure in the pipe reduced because none of the TETCO employees who viewed the corroded area believed an immediate danger existed.

Federal regulations for natural gas pipelines were not promulgated until 1971. However, since 1957 TETCO has performed annual pipe-to-soil and casing-to-soil voltage surveys 1/ at the cathodic protection test lead stations. One such station is located on the north side of SR 52 about 300 feet from the location of the pipe rupture origin. In every year except 1972, the pipe-to-soil readings were more than the -0.85 volt (the minimum required negative voltage measured between the pipe and the soil) required by 49 CFR 192. In 1972, the pipe-to-soil reading indicated -0.81 volt, which was slightly less than the requirements for adequate corrosion protection at SR 52. The condition was corrected, and readings since 1972 have been more than -1.00 volt. The results of these tests and the corrective action taken by TETCO indicate that the cathodic protection system and its monitoring complied with Federal requirements.

Additionally, on December 2, 1980, TETCO conducted, at 20-foot intervals, a pipe-to-soil voltage potential survey between mileposts 434.64 and 434.30, which included the rupture site. The readings obtained during the survey ranged from -1.06 to -1.59 volts which is well above the required -0.85 volt.

At a public hearing conducted by the Safety Board in Danville, Kentucky, on April 30 and May 1, 1986, a member of the National Association of Corrosion Engineers stated that close interval pipe-to-soil data surveys were effective, but that an interval of 2.5 feet was considered optimal for the detection of corrosion. The interval used in TETCO's 1980 survey was eight times the optimal spacing and thus, may have been the reason corrosion was not detected at that time.

Although TETCO apparently exceeded the corrosion control requirements of 49 CFR 192, severe corrosion of its pipe still went undetected until September 12, 1985, when TETCO used the in-line inspection tool. The Safety Board has learned that other pipeline companies have experienced corrosion problems in rocky environments similar to that in which the TETCO pipeline is buried. The Safety Board believes that rocky environments or other subsurface structures may shield pipelines from the electric currents of cathodic protection systems, thus causing inadequate cathodic protection in localized areas which can go undetected by the Federally-required cathodic protection testing procedures. The Safety Board is concerned that Federal regulations for cathodic protection, even when fully complied with, apparently are not sufficient to protect pipelines from severe corrosion in environments in which pipeline segments may be shielded from the cathodic protection system.

Therefore, the National Transportation Safety Board recommends that the American Gas Association and the Interstate Natural Gas Association of America:

1/ Voltage surveys—a series of electric measurements taken at specific locations along a pipeline to record the voltage of the electric current flowing between the pipe and the soil, the casing and the soil or between the pipe and the casing.

Urge its member companies to review their systems where cathodic protection shielding conditions could exist (casing, rocky environs, buried structures, etc.), advise them to use methods such as in-line inspection techniques and close interval (2.5-foot) corrosion surveys to determine if corrosive conditions exist, and, where such conditions are identified, urge that prompt corrective action be taken. (Class I, Urgent Action) (P-86-14)

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 recommendation in this letter. Please refer to Safety Recommendation P-86-14 in your reply.

GOLDMAN, Acting Chairman, and BURNETT, LAUBER, and NALL, Members, concurred in this recommendation.

By: Patricia A. Goldman
Acting Chairman