

Lay P 267 *SP-20*
NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: June 10, 1985

Forwarded to:

Mr. G.A. Lawrence
President
American Gas Association
1515 Wilson Boulevard
Arlington, Virginia 22209

Mr. Jerome J. Mc Grath
President
Interstate Natural Gas Association of America
1660 L. Street
Washington D.C. 20036

Mr. Charles J. Di Bona
President
American Petroleum Institute
2101 L. Street N. W.
Washington, D.C. 20037

SAFETY RECOMMENDATION(S)

P-85-7

About 9:15 p.m., c.s.t., on April 27, 1985, natural gas at about 960 psig ruptured a 30-inch-diameter pipeline, tore out about 29 feet of the carrier pipe, blew apart about 16 feet of a 36-inch-diameter casing pipe, blasted an opening across Kentucky State Highway 90, and cut out a pear-shaped crater approximately 90 feet long, 38 feet wide, and 12 feet deep about 2 miles east of Beaumont, Kentucky. The escaping natural gas ignited almost immediately and incinerated an area extending 800 feet north and south and 600 feet east and west of the rupture. Five persons were killed in a house about 320 feet north of the rupture, and three persons were injured in a housetrailer about 330 feet south of the rupture. The gas-fed fire destroyed two houses, three housetrailer, a sawmill, two barns, a schoolbus, numerous parked and abandoned automobiles, and nine pieces of road construction equipment.

The gas transmission pipeline was operated by the Texas Eastern Gas Pipeline Company (Texas Eastern) between Texas and New York. At 9 p.m., the pipeline was operating normally at its Tompkinsville, Kentucky, compressor station, where natural gas was being compressed to 998 psig in three large diameter pipelines (Nos. 10, 15, and 25) which extended northward from the station. At 9:15 pm, the Tompkinsville Compressor Station operator received a telephone call from a resident of Beaumont who informed him of the explosion and intense fire in the vicinity of the Texas Eastern pipelines. While proceeding to check the pressure gauges of the two compressors at the station, the operator saw a large orange glow in the sky north of the station. The station's recording discharge pressure gauge indicated a sharp, rapid pressure drop from 998 psig to less than 400 psig, at which point the recording pin went off the chart. The station operator

confirmed that the pressure drop was in the No. 10 line, closed the station valve on the No. 10 line, shut down one compressor, and then alerted company personnel by telephone to close crossover valves located about 20 miles north of the station. The crossover valves to the No. 10 lines were closed at 9:30 p.m. At 11:20 p.m., the fires had burned out except for grass fires and residual flames burning small amounts of gas at the open ends of the pipe at the rupture.

Several hours later, after the area had cooled, an inspection was made of the accident site. Safety Board investigators examined, measured, and photographed the failed pipe in the crater and six pieces of the 30-inch-diameter pipe which had been blown out of the crater and had been ripped from the main body of the pipe by the force of the explosion. Severe, extensive external corrosion pitting was found in the area of the pipe failure and a longitudinal rupture about 30 feet long extended northward within the casing. The wall thickness of the pipe had been reduced substantially by corrosion from the original specified pipe wall thickness of .375-inch to 0.140-inch and less at some locations.

The No. 10 line was installed in 1952 and was encased in a 36-inch-diameter pipe where it crossed under roads and railroads. The No. 15 line, a 30-inch-diameter pipeline constructed in 1957, lay 25 feet west of the No. 10 line, and the No. 25 line, a 36-inch-diameter pipeline constructed in 1965, lay 25 feet east of the No. 10 line.

The effectiveness of the cathodic protection of pipelines encased at road and railroad crossings can be monitored generally by measuring the voltage difference between the pipe and soil and the casing and soil. When the voltage differences between these readings is small, corrosion is more likely to occur. At State Highway 90 where the three pipelines crossed the road, the lines had been checked during the annual corrosion survey on March 29, 1985, and the following voltages had been recorded.

<u>Line No.</u>	<u>Pipe-to-Soil (volts)</u>	<u>Casing-to-Soil (volts)</u>	<u>Voltage Difference</u>
15	1.440	0.700 volt	0.740
10	1.330	1.240 volt	0.090
25	1.480	0.670 volt	0.810

At the rupture location, the No. line had only a 0.090-volt difference between the pipe and its casing, while the No. 15 line had more than eight times that difference, and the No. 25 line had nine times that difference at the same location. In general, the greater the voltage difference between the carrier pipe and its casing, the more electrically insulated the carrier pipe is from the casing pipe and the better it is protected cathodically. In its initial review of the records of a 30-mile section of the Texas Eastern pipeline system, the Safety Board determined that other pipe-to-soil and casing-to-soil readings were closely approaching the same values as the the No. 10 line and that corrosion inducing conditions may exist at other locations on the pipeline system.

In 1980, the Safety Board investigated a pipeline accident wherein corrosion had thinned the carrier pipe wall in its casing until failure occurred during a pressure surge. ^{1/}The carrier pipe ruptured 10 feet inside its casing pipe and 8,000 barrels of

^{1/} Pipeline Accident Report--"Colonial Pipeline Company Petroleum Products Pipeline Failures, Manassas and Locust Grove, Virginia, March 6, 1980" (NTSB-PAR-81-2).

kerosene escaped, some of which migrated into a river. The pipe was analyzed metallurgically and the independent testing laboratory concluded that:

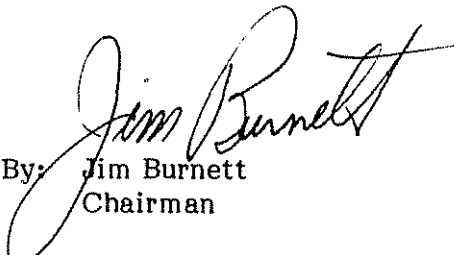
...the failure occurred at an area near the bottom of the pipe that had been thinned by corrosion. Apparently the corrosion resulted from ground water leakage past the pipe-to-casing seal and into the annular space between the pipe and casing, where the shielding effect of the casing would mitigate against obtaining adequate cathodic protection in this area...

During the investigation, the Safety Board learned that the pipeline system had 2,511 road or railroad crossings where casing was installed and that 277 of these casings were found to be shorted or partially shorted electrically. The company currently is repairing or replacing the pipe at these locations.

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

Notify member companies of the circumstances of the pipeline accident in Beaumont, Kentucky, on April 27, 1985, and urge them to review their cathodic protection test station records for pipe installed in casing, to identify those locations where there is the possibility of a direct or partial electrical short circuit, to conduct necessary inspections and tests to confirm or reject the existence of corrosion, and to take corrective action to restore cathodic protection and to eliminate unsafe conditions. (Class I, Urgent Action) (P-85-7)

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


By: Jim Burnett
Chairman