

P-120

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: May 15, 1979

Forwarded to:

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1800 South Baltimore Avenue
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SAFETY RECOMMENDATION(S)

P-79-2 through -5

At 12:02 a.m., c.d.t., on August 4, 1978, propane that had vaporized and spread widely from a ruptured 8-inch liquefied petroleum gas (LPG) pipeline owned by the Mid-America Pipeline System (MAPCO) was ignited by an unknown source in a rural area near Donnellson, Iowa. The intense fire killed two persons and critically burned three others; one of the critically burned persons later died. A farmhouse and six outbuildings were destroyed, and two adjacent homes were damaged. 1/

The MAPCO pipeline extends from west Texas to Conway, Kansas, where it forms two branches. One branch extends to Minneapolis, Minnesota and the other to Janesville, Wisconsin. The pipeline is more than 5,000 miles of multiple lines from 4 inches to 12 inches in diameter. The section of pipeline involved in this accident extends from a pump station at Birmingham Junction, Iowa, to storage tanks for truck loading facilities at Farmington, Illinois, a distance of 117 miles. This section of pipeline, called the Farmington lateral, was engineered and inspected by MAPCO personnel and installed by an independent contractor in 1962.

At the time of the accident, propane was being transported through MAPCO's main pipeline system to Iowa City. The Farmington lateral, which branches off the main line downstream of the pump station, was not operating, but was under a static pressure. The remotely operated valve that isolates the lateral located at the pump station was in the open position whether product was being delivered to the Farmington terminal or north to the Iowa City terminal or both. Therefore, the

1/ For more detailed information read "Pipeline Accident--Mid-America Pipeline System Liquefied Petroleum Gas Pipeline Rupture and Fire, Donnellson, Iowa, August 4, 1978" (NTSB-PAR-79-1).

static pressure on the lateral was almost the same as the discharge pressure of the pump station except for line elevation differences. Because of these operating conditions, the dispatcher at the Tulsa control center did not anticipate that there was a problem in the system when he first received information of a pressure drop after the pipe ruptured.

If the valve that isolates the Farmington lateral had been closed at the time of the accident, the dispatcher would have known almost immediately that the pressure drop was on the lateral and was not due to operating conditions in the main line. This information would have enabled the dispatcher to initiate an emergency response shortly before midnight instead of 12:23 a.m.; in another accident this time difference might prevent a catastrophe. Since this accident, MAPCO has established a policy that the isolation valve for the Farmington lateral at the Birmingham Junction pump station be closed when product is not moving through this lateral.

The rupture in the pipeline was approximately 33 inches long and originated on the west side of the line. It propagated longitudinally about 17 inches and then spiralled over 360 degrees at each end and stopped. Close examination of the outside surface showed gouge marks along and on either side of the fracture. The most severe gouge was approximately 7 1/2 inches long and 1/4 inch wide and was located along the bottom side of the fracture. The depth of the gouge was approximately 0.005 to 0.007 inch. Metallographic examination also indicated that the pipe had been dented.

MAPCO records and other data showed that no excavation activities other than the lowering of the pipeline had been undertaken by either the company or by others at the rupture area. This indicates that the damage was done between the time the pipe was manufactured and the time the pipeline was constructed. Even though the damaged section was relatively small and would have been difficult to detect with the naked eye, the pipe was inspected four times. The pipe was inspected at the steel mill, again when it was unloaded and stockpiled near the right-of-way, again when it was being coated, and finally when the coating was being inspected before the pipe was lowered into the ditch. Although the small size of the damage and its location toward the bottom of the pipe would have made detection difficult, the Safety Board believes that a careful, thorough inspection of the pipe during construction might have discovered the damage.

Three months before the accident, MAPCO completed lowering a section of the Farmington lateral under Highway 2 adjacent to the accident site. Because of the widening of the highway and the depth of the drainage ditches on each side of the road, it was necessary to lower the pipeline more than 11 feet. In order to obtain enough slack in the pipeline to lower it this much, the company's "rule of thumb" practice required that for every foot the 8-inch steel pipe was to be lowered, a 35-foot-long section had to be exposed.

MAPCO and contractor personnel excavated a trench 237 feet from the north side of the highway along the pipeline. Approximately every 30 feet, the crew left a column of dirt under the pipeline for support. It was later determined that MAPCO had started lowering the pipeline 15 feet from where the rupture occurred and the pipe elevation had changed 10 feet along 170 feet of pipe from that point.

The crew then cut south across the highway and dug a trench exposing the pipeline for another 290 feet. The pipeline was then reportedly lowered slowly and allowed to follow the contour of the trench. The trench was then backfilled and compacted. Additional casing was added to the original casing on the section of pipeline across the highway before backfill. The pipeline was not operating at the time the line was lowered; however, it did have a static pressure of 200 to 250 psig.

Therefore the National Transportation Safety Board recommends that the Mid-America Pipeline System:

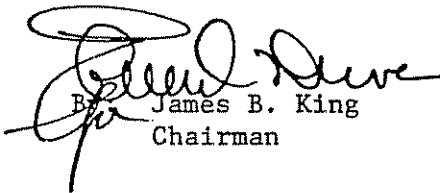
Determine by analytical means the stresses produced on the pipe steel when projects require the lowering of a section of pipeline, and design a safety factor to insure that these stresses will not affect the integrity of the line. (Class II, Priority Action)(P-79-2)

Establish written procedures that require its personnel to ascertain that precautions are taken in the field to eliminate excessive or sudden changes in elevation when lowering a section of pipeline. (Class II, Priority Action)(P-79-3)

Emphasize to its pipeline construction inspection personnel the importance of careful, thorough inspection to minimize the occurrence of dents and gouges which could result in similar accidents. (Class II, Priority Action)(P-79-4)

Check all other segments of its pipeline for conditions similar to the open valve condition in the line section involved in this accident and make changes or additions as required. (Class II, Priority Action)(P-79-5)

KING, Chairman, DRIVER, Vice Chairman, McADAMS and HOGUE, Members, concurred in these recommendations.


James B. King
Chairman