

Alert Notice

Alert Notice #: ALN-91-03 **File Code:** ALN

Date: 10/22/91

CFR Reference(s):

Keyword(s): Move, Pipeline, NTSB, Explosion

Subject:

NTSB SR P-91-2 Texas Eastern Products Pipeline Company 02/02/90 explosion: Actions to be taken before moving pipeline.



US Department of Transportation
Research and Special Programs Administration

400 Seventh Street, SW.
Washington, DC 20590

PIPELINE SAFETY ALERT NOTICE

Alert Notice: ALN-91-03

Date: 10/22/91

To: Each Owner or Operator of Gas or Hazardous Liquid Pipeline Facility and Every State Pipeline Representative

Subject:

Purpose:

OPS is alerting all operators of gas and hazardous liquid pipelines to conduct analyses before moving pipelines, whether or not the pipelines are pressurized at the time of movement. Failure to perform an analysis could increase the risk of failure during or after the movement with subsequent risk to public safety and damage to the environment. A recent pipeline accident and resulting NTSB report* which included recommendation P-91-2 have caused OPS to reevaluate factors to be considered when the movement of a pipeline is proposed. NTSB recommendation P-91-2 would:

Notice:

Background:

OPS is alerting all operators of gas and hazardous liquid pipelines to conduct analyses before moving pipelines, whether or not the pipelines are pressurized at the time of movement. Failure to perform an analysis could increase the risk of failure during or after the movement with subsequent risk to public safety and damage to the environment. A recent pipeline accident and resulting NTSB report* which included recommendation P-91-2 have caused OPS to reevaluate factors to be considered when the movement of a pipeline is proposed. NTSB recommendation P-91-2 would:

Require pipeline operators to conduct analyses, before moving pressurized pipelines to determine: (1) the extent to which the pipe may be safely moved; (2) the specific procedures required for the safe movement of the pipe; and (3) the actions taken for the protection of the public.

On February 20, 1990, the Texas Eastern Products Pipeline Company began repairs to a liquid propane pipeline at a horizontal road crossing on a hillside. The carrier pipeline was raised in order to complete the work and was lowered into its approximate original position when the work was complete.

On March 15, 1990, a leak and explosion occurred at the site of the pipe movement. The explosion and ensuing fire resulted in 2 fatalities, 2 serious injuries, 5 minor injuries, and total estimated damage to the community of \$654,000.

NTSB investigated the accident and its report states that the probable cause of the rupture, subsequent release of propane, and resultant explosion and fire was the failure of the pipeline company to provide adequate procedures, equipment, training, and management oversight to ensure that maintenance on its pipelines was accomplished using methods and equipment that protected its equipment and the public.

Battelle conducted a metallurgical investigation of the failed carrier pipe and reported** that the carrier pipe had experienced a brittle circumferential fracture because it had no toughness (resistance to brittle fracture) at the approximate service temperature. The failure was believed to have occurred because of an unusual combination of circumstances which included: (1) substantial stresses existing since the time of construction in the vicinity of elastic bending at the point where the carrier pipe exited the downhill end of a casing; (2) an increase in the bend radius and elastic stress after the pipe was lifted and re-lowered; (3) the presence of an arc burn containing a crack at the point of origin in the zone of high elastic bending stresses; and (4) the brittle characteristic of the failed pipe at the operating temperature.

A similar failure in 1978 led to a Battelle study and report*** in which guidelines for the lowering of pipelines while in service were discussed. The report indicated that the following factors must be considered when a pipeline is to be lowered: (1) the required deflection; (2) the diameter, wall thickness, and grade; (3) characteristics of the pipeline; (4) the terrain; (5) the soil; (6) safety; and (7) stress. Although each of the model calculations for estimating safe stress considered in the report contained a factor for toughness, the stress calculation proposed for use in the guidelines did not include a toughness factor because the toughness of most existing pipelines is not known. OPS believes that pipe toughness must be considered when analyzing the risk of moving a pipeline. In the absence of known toughness in the steel in a specific pipeline segment, operators should assume that the steel has not toughness.

The Gas Piping Technology Committee (GPTC) of the American Gas Association (AGA) in its published guide for gas piping systems**** has cited the Battelle report*** as useful for determining the feasibility of safely realigning piping.

In view of the above, OPS urges each pipeline operator to take the following actions prior to moving a pipeline:

1. Conduct a thorough analysis before moving the pipeline to determine: (1) the extent to which the pipe may be safely moved; (2) the specific procedures required for the safe movement of the pipe; and (3) the actions to be taken for the protection of the public.
2. Determine the toughness of the pipeline if known, or, if not known, assume that the material in the pipeline is brittle.
3. If the pipeline is known to be or assumed brittle, consider that, in addition to those factors developed by Battelle, lack of toughness may indicate a reason not to move the pipeline.

Since many operators do not know the material characteristics of steel pipelines in operation, samples of new and stock pipe of pipe removed from service should be tested and the results accumulated into a database to characterize the properties of pipe in each pipeline system. Test performed should establish Charpy toughness fracture appearance and energy absorbed, and also chemical composition, tensile properties, metallurgical structure, and method of pipe manufacture. OPS considers that it is acceptable to determine Charpy toughness on the basis of values determined using subsize and flattened specimens as long as the method of sampling and specimen preparation is traceable in recorded data.

OPS will review its current regulations to determine the extent to which requirements applicable to the movement of pipelines should be included.

George W. Tenley, Jr., Associate Administrator, Office of Pipeline Safety

REFERENCES:

* Pipeline Accident Report PB91-916501, NTSB/PAR-91/01, "Liquid Propane Pipeline Rupture and Fire, Texas Eastern Products Pipeline Company, North Blenheim, NY, March 13, 1990," published June 11, 1991, by the NTSB.

** Battelle report titled "Investigation of Failure in 8-Inch Line P-41 in Schoharie County, NY, to Texas Eastern Pipeline Products Company," dated July 1990.

*** Final Report on "Guidelines for Lowering Pipelines While in Service," published February 25, 1985, by Battelle, Columbus Laboratories, Columbus, OH.

**** GPTC "Guide for Gas Transmission and Distribution Piping Systems" -- 1990/91, including Addenda No. 1, issued August 1991.

