



National Transportation Safety Board

Washington, D.C. 20594
Safety Recommendation

Log P-282B

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In reply refer to: P-86-13

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About 10:30 a.m. on July 23, 1985, in a rural area about 8 miles south of Kaycee, Wyoming, a girth weld cracked during a pipeline recoating project on a 23-year-old, 8-inch-diameter pipeline owned by the Continental Pipe Line Company. The cracked girth weld allowed the release, atomization, and ignition of aircraft turbine fuel under 430 pounds pressure, killing one person, burning six persons, destroying construction equipment, and shutting down the pipeline. Damage was estimated at more than \$128,000. ^{1/}

In 1984, the Continental Pipe Line Company (CPL) contracted with the Vic Albee Construction Company (contractor) to excavate, clean, inspect, and recoat sections of CPL's 8-inch-diameter, 333-mile-long refined products pipeline that operated between Billings, Montana, and Sinclair, Wyoming. CPL did not issue to the contractor any formal written specifications or instructions with detailed procedures for performing the work. CPL gave the contractor a copy of CPL's Safety Manual, which addressed general safety requirements but did not address line recoating projects.

The forces generated by the weight of the pipe and the kerosene it contained, the internal pressure, and the upward pull of the sideboom upon the pipe resulted in a girth weld failure, which allowed the kerosene to be released and exposed to an ignition source. Excavating, lifting, cleaning, wrapping, and lowering the pipe back down into the ditch after its being undisturbed for more than 20 years exposed the pipe involved in this accident to many forces and strains which are calculable by complex mathematical formulae such as those contained in the Battelle Report, "Guidelines For Lowering Pipeline While In Service." It is not appropriate to put an employee in charge of a recoating project and to employ a contractor for that project solely because they both "have a lot of pipeline experience." While this experience is both good and necessary, it

^{1/} For more detailed information, read Pipeline Accident Report—"Continental Pipe Line Company Pipeline Rupture and Fire, Kaycee, Wyoming, July 23, 1985" (NTSB/PAR-86/01).

is not enough. Specific, detailed, written instructions and guidelines for the unearthing, handling, and repositioning of pipelines under pressure are necessary. In addition, the inspector should have been thoroughly briefed about the possibility of encountering substandard welds and what to do if he found some.

Paragraph 195.402 of the Federal regulations for liquid petroleum pipelines states that "each operator shall prepare and follow for each pipeline system a manual of written procedures for conducting normal operation and maintenance activities and handling abnormal operations and emergencies." Recoating an existing pipeline would be considered a maintenance activity and should have a written procedure specifically for that task. Without such instructions or guidelines, the safe and successful conduct of the recoating activity is left to the varying abilities of both the contractor and the company inspector, whose qualifications were never properly defined or evaluated. CPL should have provided its inspectors and its contractor specific procedures to guide their actions during this unique operation and should have provided specific training in those procedures. It is likely that if CPL had issued specific instructions about this procedure and the workers had followed these instructions, the girth weld in this case might not have cracked or might have sustained a smaller crack, resulting in the escape of less kerosene and a less dangerous fire.

The Safety Board, in its investigation of a natural gas explosion and fire near Monroe, Louisiana, on March 2, 1974, wherein a substandard girth weld on a 30-inch-diameter natural gas pipeline failed at 797 pounds pressure inside a 34-inch-diameter casing pipe under a road, found that:

Although even a substandard girth weld can sustain much internal pressure without failing, if internal pressures are combined with external pipe movement, the weld may fail. Although girth weld failures are few compared to total reported failures, the girth weld failure may completely sever a pipe and, therefore, constitute a serious failure in a transmission line.

This type of accident could have been foreseen had CPL instituted and implemented a systematic approach to pipeline safety that included a job/task analysis of the pipeline recoating operations to provide data in support of the development of proper selection and qualifications criteria, training programs, and normal and emergency procedures. In its 1972 special study, "A Systematic Approach to Pipeline Safety" (NTSB-PSS-72-21), the Safety Board stated:

System Safety is the optimum degree of hazard elimination and/or control within the constraints of operational effectiveness, time and cost, attained through the specific application of management, scientific, and engineering principles throughout all phases of a system life cycle.

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By using the systematic approach to safety, pipeline accidents can be predicted and analyzed before they occur. They can then be prevented by taking the action necessary to eliminate or control the hazards which lead to accidents. System analysis methods will identify possible hazards. Risks will not be assumed unknowingly. Those risks which are assumed will be those that have been identified, and in which a management decision had been made to accept them.

As a result of its study, the Safety Board issued Safety Recommendation P-72-1 on July 11, 1972, to the API:

Develop guidelines for the use of systems safety by liquid pipeline operators. These guidelines should serve a similar function for liquid pipeline systems as the Military Standard, Requirements for System Safety Program for Systems and Associated Subsystems and Equipment (MIL-STD882), does for military systems. These guidelines should cover the full life cycle of liquid pipeline systems, and be applicable to the design of new pipelines as well as to the operation and maintenance of existing pipelines. This work should be undertaken with the cooperation of the American National Standards Institute Section Committee for Liquid Petroleum Transportation Piping Systems (ANSI-B31.4).

In response to Safety Recommendation P-72-21, the API stated that it had modified its "Recommended Practice for Analysis, Design, Installation and Testing of Basic Surface Systems on Offshore Production Platforms" (API RP-14C 1974) and its "Recommended Practice for Design, Construction, Operation, and Maintenance of Offshore Hydrocarbon Pipelines" (1976). Moreover, the API advised that the American National Standards Code for Pressure Piping, "Liquid Petroleum Transportation Piping Systems" (ANSI B31.4-1974), had been reviewed to ensure that applicable systematic and proven safety analyses were embodied in that code. It characterized the code as simplifying the systematic consideration of pipeline-designed criteria by the pervasive use of the code throughout the petroleum pipeline industry and the fact that the code serves both as a guide and a checklist. For these reasons the API indicated that, for the most part, it was unnecessary to analyze each system separately.

The Safety Board has reviewed this code and cannot identify either specific guidance for recoating projects or the precautions to be taken when lifting pipelines operating under pressure. Furthermore, this code does not specifically advocate the use of proven safety analysis techniques to support the planning of work not specifically addressed within the code. Consequently, the Safety Board has closed this recommendation as "Unacceptable Action".

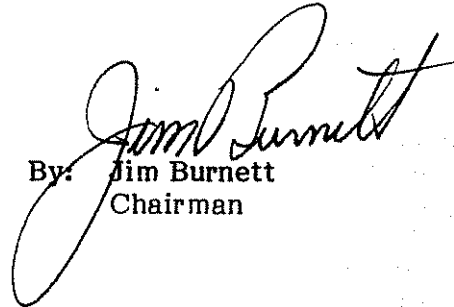
CPL should have used a system safety approach when it planned to unearth and to lift the 22-year-old pipeline operating under pressure. If CPL had analyzed the planned work and identified the potential failure modes (including sources of human error), CPL could have developed procedures to minimize the hazard and would have known how to train its inspectors and its contractor specifically for the task requirements of this job. Such actions would have substantially reduced the likelihood of an accident.

Many natural gas and liquid petroleum pipeline companies are becoming increasingly involved in recoating and relocation projects, both of which involve unearthing and moving older pipelines with the resultant disturbance of their girth welds that could lead to similar accidents of this type. Close inspection of the pipe and special handling should be paramount for all companies involved in recoating and relocation projects, and specific written instructions and guidelines should be provided for this type of work. The conduct of appropriate safety analyses should be the first step.

Therefore, the National Transportation Safety Board recommends that the American Society of Mechanical Engineers, Gas Piping Standards Committee, and the American Petroleum Institute:

Apply the research findings contained in the Battelle Columbus Laboratories, "Guidelines For Lowering Pipelines While in Service" to develop guidelines for the safe raising and recoating of pipelines while in service. The guidelines should include, at minimum, procedures for the lifting of pipe considering the lifting forces on the pipe and on the girth welds, the location of the greatest lifting forces, and recommendations concerning lift location and girth weld inspection prior to lifting. (Class II, Priority Action) (P-86-13)

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


By: Jim Burnett
Chairman