Log P-282

National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: April 17, 1986
In reply refer to: P-86-9 thru -11

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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.

Three CPL inspectors had worked on the recoating project throughout the summer of 1985. None of the three had received specific classroom or on-the-job training in the lifting and the recoating of existing pipelines. Each person had been selected for the job based on his previous general pipeline experience. The inspector on the job at the time of the accident was a supervisor who had 18 years of experience with CPL and 12 years of experience with an oil company. He had worked on this recoating project as an inspector in 1984 and 1985. He was not a qualified welder or welding inspector. His training consisted primarily of supervisory sessions wherein personal safety issues were discussed. The company has no position description detailing the responsibilities of an inspector for pipeline recoating and other special projects. In this instance, the term "inspector" does not indicate any prescribed level of expertise.

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. A properly made girth weld should be stronger than the pipe it joins and its failure, rather than the failure of the pipe, indicates that the girth weld was one of poor

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).

quality which should have been detected and rejected during construction of the pipeline in 1963. The postaccident metallurgical analysis of the pipe showed that the girth weld that failed and four other welds on the pipe were of poor quality.

Even without nondestructive testing, these welds should have been rejected based upon the generally poor appearance of their weld caps, which did not meet the API 1104 standard, section 1.432, 1961 edition. The poor appearance of a weld cap often indicates careless welding. A good, experienced welding inspector should have noticed the poor appearance of the cap welds, cautioned the welder about the work, and then had the welds tested radiographically to verify their quality.

The careful visual inspection by a qualified welding inspector of the cleaned, exposed girth welds should have been a top priority. Therefore, the CPL should have assigned a qualified person to perform the inspection of this pipeline recoating project. Nonetheless, it is the Safety Board's opinion that more effective inspections could have been performed by the CPL inspector who was assigned if he had been told what to look for specifically and what to do if he saw substandard welds. To overlook one rough-appearing, concave girth weld or to simply consider it marginal, as the CPL inspector did, might be understandable; however, finding several welds of the same poor appearance should have alerted the inspector assigned to this project even with his level of experience as an inspector for this recoating project.

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. 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 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 defective 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.

In addition, CPL should have made sure that the contractor and the inspector had specific and independent roles and that each was aware of his role and responsibility within that role. In this case however, even though he was hired as an "independent contractor," in reality the contractor looked for guidance from the CPL inspector. The CPL inspector many times instructed the contractor's personnel on how to do a job, such

as how far ahead to keep the backhoes digging and how to handle the pipe. Specific job/task assignments by management at the beginning of this job could have solved the problem.

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.

Therefore, the National Transportation Safety Board recommends that the Continental Pipe Line Company:

> Through the use of job/task and other safety analysis techniques, develop and issue written procedures which, at a minimum, include inspections to be performed before raising pipelines from their foundations and procedures to be followed for safely raising pipelines during these projects. (Class II, Priority Action) (P-86-09)
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> Based on the results of the job/task analysis, develop and conduct selection and training programs to produce employees and contractor personnel who are properly qualified and trained to perform the pipeline recoating operations. (Class II, Priority Action) (P-86-10)
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> Based upon the results of the job/task analysis, establish inspection and work standards for pipeline recoating operations and conduct periodic quality assurance reviews to measure the adequacy of the level of inspection provided on-site at pipeline recoating projects. (Class II, Priority of Action) (P-86-11)

BURNETT, Chairman, GOLDMAN, Vice Chairman, and LAUBER, Member, concurred in these recommendations.

By: Jim Burnett
Chairman