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National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: July 20, 1990

In reply to: P-90-24 and -25

Mr. Travis Dungan
Administrator
Research and Special Programs Administration
400 Seventh Street, S.W.
Washington, D.C. 20590

About 7:36 a.m., Pacific daylight time, on May 12, 1989, Southern Pacific Transportation Company (SP) freight train 1-MJLBP-111, which consisted of a four-unit locomotive on the head end of the train, 69 hopper cars loaded with trona, and a two-unit helper locomotive on the rear of the train, derailed at milepost 486.8, in San Bernardino, California. The entire train was destroyed as a result of the derailment. Seven homes located in the adjacent neighborhood were totally destroyed and four others were extensively damaged. Of the five crewmembers onboard the train, two on the head end of the train were killed, one received serious injuries, and the two on the rear end of the train received minor injuries. Of eight residents in their homes at the time of the accident, two were killed and one received serious injuries as a result of being trapped under debris for 15 hours. Local officials evacuated homes in the surrounding area because of a concern that a 14-inch pipeline owned by the Calnev Pipe Line Company, which was transporting gasoline and was located under the wreckage, may have been damaged during the accident sequence or was susceptible to being damaged during wreckage clearing operations. Residents were allowed to return to their homes within 24 hours of the derailment.

About 8:05 a.m., on May 25, 1989, 13 days after the train derailment, the 14-inch pipeline ruptured at the site of the derailment, released its product, and ignited. As a result of the release and ignition of gasoline, 2 residents were killed, 3 received serious injuries, and 16 reported minor injuries. Eleven homes in the adjacent neighborhood were destroyed, 3 received moderate fire and smoke damage, and 3 received smoke damage only.

In addition, 21 motor vehicles were destroyed. Residents within a four-block area of the rupture were evacuated by local officials.[1]

The exact timing of the damage and the precise manner in which the damage was inflicted is not, in the Safety Board's view, the major safety issue; rather that Calnev recognized that damage to its pipeline could occur as a result of the derailment, the wreckage clearing operations, and the trona removal, but failed to perform adequate inspections or tests of the pipeline to determine that it had not been damaged before resuming normal operations. Although Calnev had the greater responsibility to protect its pipeline, SP was aware of the potential for damage during the wreckage removal and cleanup, and it had a responsibility to prevent damage to the pipeline.

Calnev prudently decided to use its employees and its contract personnel to remove the trona over the pipeline and to excavate and inspect the pipeline in areas where train wreckage penetrated the ground. In so doing, Calnev minimized the opportunity for excavation equipment not under its control to damage its pipeline and afforded the company the opportunity to determine if any of the train wreckage had penetrated the ground to a depth that may have compromised the integrity of the pipeline. However, Calnev apparently did not adequately consider the potential for damage that could have been caused earlier by excavation equipment during the wreckage removal or later during the removal of the trona from the accident site. Action to properly and fully assess the condition of the pipeline could have been achieved by following one of three procedures: by excavating and visually inspecting the entire pipeline through the derailment area after all equipment had been removed from the site, by performing a hydrostatic test at a level capable of confirming the integrity of the strength of the pipe, or by using internal inspection instruments capable of detecting pipe wall reductions and pipe diameter abnormalities.

To have performed a hydrostatic strength test, Calnev would have had to remove the petroleum product from the pipeline and to have tested that section of pipeline between Colton and Cajon Pass, or would had to have taken additional action such as separating the pipeline on either side of the derailment area and hydrostatically testing the pipeline section through the derailment area. This would have involved removal of the water from the tested section and then reconnecting the tested section to the pipeline. To have used the internal inspection instrument, Calnev would have had to install at some point downstream of the derailment area a means for receiving and removing the internal inspection instrument, and would have had to place the pipeline in operation at a pressure sufficient to move the internal inspection instrument through the pipeline to the receiving point. Although each of the three inspection or test procedures could have been performed, visual inspection of the pipeline within the derailment area was the most

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[1]For more detailed information, read Railroad Accident Report--"Derailment of Southern Pacific Transportation Company Freight Train on May 12, 1989, and Subsequent Rupture of Calnev Petroleum Pipeline on May 25, 1989, at San Bernardino, California" (NTSB/RAR-90/02).

practical procedure given the existing configuration of the pipeline because this method would have only required the pipeline to be kept out of operation until the inspection had been performed; no special arrangements or changes to the pipeline would have been required.

However, had the pipeline configuration permitted the use of an internal inspection instrument without having to increase substantially the pressure then in the pipeline, such an inspection would have readily revealed the damages in the pipe wall and their locations without having to excavate the entire pipeline or without having to take the pipeline out of service. The Safety Board discussed in its 1987 report of gas pipeline ruptures and fires at Beaumont, Kentucky,[2] the capabilities and limitations of internal inspection equipment, the special provisions that must be made in the configuration of pipelines to use this equipment, the fact that many pipelines are not configured to accept and use this equipment, and the fact that the Federal pipeline safety standards do not require pipeline operators to use this equipment. Because the Safety Board believed that many potentially hazardous conditions, such as the damage to the Calnev pipeline, could be identified through the use of internal inspection equipment before an accident occurred, the Board, on March 24, 1987, issued the following safety recommendations to the Research and Special Programs Administration:

P-87-6

Require existing natural gas transmission and liquid petroleum pipeline operators when repairing or modifying their systems, to install facilities to incorporate the use of in-line [internal] inspection equipment.

P-87-7

Require that all new gas and liquid transmission pipelines be constructed to facilitate the use of in-line [internal] instrument inspection equipment.

On April 29, 1987, RSPA advised the Safety Board that the topics addressed by the recommendations were related to a proposal included in an advance notice of proposed rulemaking (ANPRM) (Docket PS-93) issued earlier in 1987, and that it was reviewing the subsequent comments to assist in developing a further position on the need for new inspection or testing requirements.

On June 8, 1990, RSPA issued a notice (55 FR 23514) advising that, in accordance with section 304 of the Pipeline Safety Reauthorization Act of 1988 (Public Law 100-561), it had begun a study on the feasibility of requiring operators to use internal inspection instruments to test their pipelines at periodic intervals. Intervals would be determined by applying

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[2] Pipeline Accident Report--"Texas Eastern Gas Pipeline Company Ruptures and Fires at Beaumont, Kentucky, on April 27, 1985, and Lancaster, Kentucky, on February 21, 1986," (NTSB/PAR-87/01).

operational factors such as location; size, age, manufacturer, and type of pipe; nature and volume of materials transported; frequency of leaks; present and projected population adjacent to pipelines; and climatic, geologic, and environmental conditions of the areas in which pipelines are located. RSPA advised that the completed study would be submitted to the Congress in 1990; if the results are positive, new rulemaking will be initiated. RSPA further advised that, as required by sections 108(b) and 207(b) of the Reauthorization Act, it will establish requirements for new and replaced gas transmission lines and hazardous liquid pipelines to be designed to accommodate the passage of internal inspection instruments. RSPA also advised that an NPRM has been scheduled but did not provide the scheduled date. Although the Safety Board notes that RSPA has pledged to consider the merits of Safety Recommendations P-87-6 and -7 and to require operators to design new and rebuilt pipelines to accommodate the use of internal inspection instruments, the safety recommendations have been classified as "Open--Unacceptable Action," because of RSPA's apparent reluctance to consider them until required by the Congress to do so and because of the time that elapsed before RSPA initiated action.

The first mainline block valve from the Colton Pump station was located at MP 25.7. It took 55 minutes for a Calnev employee to drive from the Colton station and manually close the block valve. Since the pipeline rupture, Calnev has installed a remotely operable block valve at MP 6.9. In the event of an emergency situation, this valve can be remotely closed by the pipeline dispatcher at the Colton Pump Station within a minute after being notified of an emergency. However, the installation of the remotely operated valve at MP 6.9 does not reduce the hazard posed to the residential communities that now exist or that will be constructed adjacent to this pipeline downstream (north) of MP 6.9 in the future, given that the check valve at MP 14.9 has yet to be inspected or replaced. Consequently, residents could still be subjected to about 12,000 barrels of fuel in the event of a rupture. The Safety Board believes that the spacing between block valves in this increasingly populated area is excessive and that there is a need for the rapid shutdown of failed segments of pipeline.

The Safety Board has previously addressed the need for rapid shutdown of failed segments of pipeline. As a result of its report on the Williams Pipe Line Company rupture at Mounds View, Minnesota,[3] the Board recommended that the Office of Pipeline Safety (OPS):

P-87-22

Require the installation of remote-operated valves on pipelines that transport hazardous liquids, and base the spacing of remote-operated valves on the population at risk.

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[3] Pipeline Accident Report--"Williams Pipe Line Company Liquid Pipeline Rupture and Fire, Mounds View, Minnesota, July 8, 1986," (NTSB/PAR-87/02).

On May 9, 1988, RSPA advised the Safety Board that it had initiated a technical study, to be completed in 1988, to assess the feasibility, safety, cost, and effectiveness of the use of remote and automatic control valves in certain pipeline situations, particularly in populated areas. RSPA also advised the Board of a previous consideration it had made on the need for remotely operated valves and their spacing. Its first notice of proposed rulemaking action had been published on November 5, 1978; however, this proposed action was subsequently withdrawn because engineering and economic studies indicated that remotely controlled valves were not an effective means to reduce the potentially hazardous consequences of accidents to pipelines transporting highly volatile liquids. RSPA advised that the findings of its technical study would be reviewed to determine "the extent that and under what conditions the use of such valves show a positive safety benefit. If the results are positive, we will initiate rulemaking." RSPA advised the Safety Board that its Administrator has concurred with the completed staff report on this study and that the report will be forwarded to the Office of the Secretary for review. Also in its June 8, 1990, notice on Docket PS-93, RSPA advised that there does not appear to be sufficient justification to require the installation of remotely controlled or automatic shutoff valves at uniform intervals along the entire length of gas and liquid pipelines. RSPA further advised,

> However, as required by section 305 of the Reauthorization Act, OPS is conducting a study to determine whether automatic or remote-control valves may be needed to enhance safety in critical situations along a pipeline. Information is being collected about the safety, cost, feasibility and effectiveness of requiring the use of these valves or other emergency flow restriction devices in these situations. (See Notice 1, Docket PS-104; 54 FR 20945, May 15, 1989.) This study will be submitted to Congress as required by the Reauthorization Act. If the results provide a basis for improving pipeline safety, new rulemaking will be initiated.

Safety Recommendation P-87-22 has been classified as "Open--Unacceptable Action" because again of RSPA's apparent reluctance to consider the recommendation until required by the Congress to do so and because of the time that elapsed before RSPA initiated action.

The Safety Board continues to be concerned that the Federal regulations do not address the need to promptly detect and shut down failed sections of pipelines and, as a result of the circumstances of this accident, is concerned that they do not specifically address the inspection and testing of check valves when installed. Had the check valve at MP 6.9 been periodically checked and maintained during the years before this accident to ensure that it functioned properly, the consequences of the May 25 rupture would have been substantially less destructive.

The Federal pipeline safety regulations, 49 CFR Parts 192 and 195, do not define "valve," "mainline valve," or "block valve." The regulations do include specific requirements on the location, accessibility, and maintenance of valves, and they specifically require an operator to maintain in good

working order at all times each valve that is necessary for the safe operation of its pipeline. The Safety Board notes from the OPS representative's testimony at the Board's public hearing on this accident that the circumstances of the Calnev accident have prompted the OPS to review its policy on the treatment of check valves. In response to Safety Recommendation P-89-6, RSPA has initiated a study, to be completed in August 1990, to determine the feasibility of establishing inspection, maintenance, and test requirements to demonstrate and maintain the proper functioning of check valves installed in pipeline systems. The Safety Board believes that the RSPA study should also address the lack of definitions for the various terms used for valves in the pipeline safety regulations.

The circumstances of this accident attest to the need for improvements in the Federal regulations for prompt detection and shutdown of failed liquid pipelines--a safety improvement long sought by the Safety Board. Both the liquid and the natural gas pipeline Federal regulations were based on industry codes ASA B31.8 for 49 CFR Part 192 (the natural gas pipeline regulations) and ASA B31.4 for 49 CFR Part 195 (the liquid pipeline regulations). The Safety Board has previously noted that the industry code for gas pipelines took into account population densities for construction, valve spacing, testing, and many other safety requirements whereas the industry code for liquid pipelines did not. To construct a pipeline in San Bernardino adjacent to Calnev's pipeline, the design for a natural gas pipeline would have to comply with several population-based safety factors such as the allowable operating stress level, mainline valve spacing, and the hydrostatic testing level; no population-based safety factors would apply to the design of a liquid pipeline constructed in the same location. Additionally, a natural gas pipeline installed in the area of the Calnev pipeline would be subject to several population-based operating and maintenance requirements including the requirement to reduce the operating stress in the pipe by lowering the internal pressure should the population density increase to specified levels; a liquid pipeline would not be subject to the requirements. Recognizing the above related differences between the two sets of pipeline safety regulations, the Safety Board, as a result of its investigation of a petroleum gas pipeline rupture in West Odessa, Texas, on March 15, 1983,[4] recommended that RSPA:

P-84-26

Amend Federal regulations governing pipelines that transport highly volatile liquids to require a level of safety for the public comparable to that now required for natural gas pipelines.

RSPA responded on April 7, 1986, that the maximum allowable operating pressure for gas pipelines was based on the maximum hoop stress levels in the line as a function of population densities adjacent to the lines. The letter further stated that "In contrast, stress level does not appear to be a

[4] Pipeline Accident Report--"Mid America Pipeline System Liquefied Petroleum Gas Pipeline Rupture, West Odessa, Texas, March 15, 1983" (NTSB/PAR-84/1).

significant factor in HVL [high volatile liquid] pipeline accidents. In fact, we are not aware of any HVL pipeline accident that has involved a long-running fracture...."

In a letter to RSPA on August 20, 1986, the Safety Board stated:

> ...the Research and Special Programs Administration (RSPA) may have missed the thrust of this recommendation. The Safety Board is recommending that the safety standards for liquid pipelines be equivalent to natural gas pipeline standards....Based on our knowledge of the history of the ANSI B31.8 Code, the industry rationale for development of the population based class location criteria was not solely in response to its concern about fracture propagation; it was also in response to industry's over all concern about the increasing populations residing adjacent to its pipelines which initially were located in noninhabited areas....Furthermore, the Board did not make its assessment solely on the basis that the gas standards contained requirements tied to class locations rather its assessment was that the overall standards were not as stringent in many respects as those for gas pipelines.

The Safety Board classified Safety Recommendation P-84-26 as "Open--Unacceptable Action." Subsequently, on February 11, 1987, RSPA issued an ANPRM (Docket PS-93) addressing amendments to the safety standards for gas and hazardous liquid pipelines. The Safety Board provided comments to the docket on this ANPRM and reclassified the recommendation as "Open--Acceptable Action." At the time RSPA informed the Safety Board of the ANPRM, it also informed the Board that it was planning a research study in fiscal year 1988 to determine if there is a difference in the levels of safety provided for liquid pipelines and for gas pipelines. RSPA has advised the Safety Board that the report on this study has been drafted; however, completion and issuance of the report has been delayed because OPS has an insufficient number of staff members to accomplish this work and the work mandated by Congress in RSPA's Reauthorization Act.

As a result of its investigation of the liquid pipeline rupture and fire in Mounds View, Minnesota, on July 8, 1986, the Safety Board reiterated Safety Recommendation P-84-26 to RSPA and reconfirmed its position that there is a difference in the level of safety and that RSPA should take action to eliminate this difference. The Safety Board's investigation of the train derailment and pipeline rupture at San Bernardino, California, heightens the Board's concern that the difference in the level of safety provided for liquid pipelines and for gas pipelines has not been eliminated. In its June 8, 1990, notice on Docket PS-93, RSPA addresses some issues related to Safety Recommendation P-84-26. On the issue of improved populated-based leak detection and isolation requirements through remotely controlled valves and remotely monitored gauges and meters, RSPA stated "that pipeline-simulation technology for more rapid leak detection and shutdown is not sufficiently developed for general use. Operators now are required to monitor their pipelines for leaks and other indications of abnormal operations and to take appropriate corrective actions if necessary." RSPA also stated that it is continuing to study the capabilities of advanced supervisory control and data

acquisition systems and the benefits of using remotely controlled or automatic valves to isolate line sections where leaks are located. RSPA plans to initiate further rulemaking with respect to these subjects if its studies demonstrate that net benefits can be achieved in particular situations.

On the issue of establishing population-based class location criteria for liquid pipelines and establishing more stringent safety standards as the population-at-risk increases, RSPA states that Part 195 now contains many safety standards that vary in stringency according to population characteristics, although a class location scheme is not employed. RSPA stated that a study is near completion on the need to amend these regulations to establish more stringent safety standards for hazardous liquid pipelines in populated areas, and the results of this study will determine if further rulemaking on this subject is required. Because RSPA contends that Part 195 contains population-based safety standards, Safety Board staff again reviewed these regulations. A few requirements, primarily related to construction and testing when a pipe is initially constructed, contain general statements such as "avoid as far as practicable" populated areas or establish distances that newly constructed pipelines must be offset from existing buildings. The review of Part 195 found no safety requirement that required additional action of a liquid pipeline operator as a result of increased population adjacent to a pipeline. For a pipeline initially constructed through uninhabited land, no change in the pipeline or in its manner of operation and maintenance would be required under Part 195, even when a metropolitan area had been constructed adjacent to the pipeline. The Safety Board urges RSPA to objectively assess the increased operating, maintenance, and emergency response requirements essential to provide reasonable public safety when a greater number of people are exposed to risks of unintended releases of hazardous liquids from pipelines. Safety Recommendation P-84-26 has been reclassified as "Open-Unacceptable Action" because RSPA has taken no action to implement the recommendation and because RSPA's comments on subjects related to this recommendation are more directed at supporting existing regulations rather than objectively assessing the need to improve the existing regulations.

Therefore, the National Transportation Safety Board recommends that the Research and Special Programs Administration:

> Address, in the ongoing study to determine the feasibility of establishing inspection, maintenance, and test requirements for check valves, the lack of definitions for the various terms used for valves in the pipeline safety regulations. (Class II, Priority Action) (P-90-24)

> Require, in conjunction with the Federal Railroad Administration, operators of pipelines located on or adjacent to railroad rights-of-way to coordinate with the railroad operators the development of plans for handling transportation emergencies that may impact both the rail and pipeline systems and then to discuss the plan with affected State and local emergency response agencies. (Class II, Priority Action) (P-90-25)

The Safety Board also reiterates the following safety recommendations to RSPA:

P-84-26

Amend Federal regulations governing pipelines that transport highly volatile liquids to require a level of safety for the public comparable to that now required for natural gas pipelines.

P-87-6

Require existing natural gas transmission and liquid petroleum pipeline operators when repairing or modifying their systems, to install facilities to incorporate the use of in-line [internal] inspection equipment.

P-87-7

Require that all new gas and liquid transmission pipelines be constructed to facilitate the use of in-line [internal] instrument inspection equipment.

P-87-22

Require the installation of remote-operated valves on pipelines that transport hazardous liquids, and base the spacing of remote-operated valves on the population at risk.

Also, the Safety Board issued Safety Recommendations R-90-12 through -21 to the Southern Pacific Transportation Company; R-90-22 through -25 to the Federal Railroad Administration; R-90-26 and -27 to the Association of American Railroads; P-20-22 and -23 to the Calnev Pipe Line Company; I-90-18 and -19 to the City of San Bernardino; and I-90-20 to the National Association of Counties and the National League of Cities. The Safety Board also reiterated Safety Recommendation R-89-50 to the Federal Railroad Administration.

KOLSTAD, Chairman, COUGHLIN, Vice Chairman, and LAUBER and BURNETT, Members, concurred in these recommendations.

By: James L. Kolstad
Chairman