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NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: May 7, 1980

Forwarded to:

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SAFETY RECOMMENDATION(S)

P-80-34 through -38

About 3:35 a.m., e.d.t., on October 6, 1979, an explosion caused by liquefied natural gas (LNG) vapors destroyed a transformer building at the reception facility of the Columbia LNG Corporation, Cove Point, Maryland. Odorless liquefied natural gas leaked through an inadequately tightened LNG pump seal, vaporized, passed through approximately 210 ft of underground electrical conduit and entered the substation building. One person was killed, and one person was seriously injured. Damage to the facility was estimated at about \$3 million. 1/

At no time during the planning, design, or construction phases of the Cove Point LNG facility were safety analysis performed. The Safety Board first recommended the use of safety analysis to the natural gas industry in 1972 in a special study. 2/ The study pointed out that safety analysis ". . . need not be a highly complicated task." The study noted that by using safety analysis techniques to identify and evaluate system hazards, management would be able to make knowledgeable decisions about which hazards to eliminate, which hazards to control, and the degree of residual risks it was accepting. The safety problem posed by a failed pump seal leaking LNG into the electrical conduit could have been detected during the design of this LNG facility through the application of the most basic safety analysis techniques. The Safety Board is not aware of any LNG facility which has employed safety analysis techniques to identify and eliminate or control system hazards through all phases of a facility's life cycle.

1/ For more detailed information read "Pipeline Accident Report—Columbia LNG Corporation, Explosion and Fire, Cove Point, Maryland, October 6, 1979" (NTSB-PAR-80-2).

2/ For more detailed information read "Special Study—A Systematic Approach to Pipeline Safety, May 25, 1972" (NTSB-PSS-72-1).

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The Cove Point LNG facility was equipped with 109 combustible gas indicators (CGIs). CGIs provide the facility's process area with its only means of detecting vaporized LNG leaks by instrument. The 105J pumphouse was equipped with three CGIs located inside about 25 ft above the pumps. Substation No. 2 was not equipped with a CGI. The CGIs in the 105J pumphouse were operating before and after the accident; however, the alarm did not activate even though large quantities of LNG were leaking into the pumphouse. If a CGI had been installed in the substation, it probably would have detected the LNG vapors and activated the alarm in the monitor house.

Although Columbia LNG Corporation developed a fairly comprehensive emergency response plan and safety procedures, the Cove Point employees were not given sufficient instructions to insure their effective implementation. The Safety Board believes that a comprehensive familiarization program, which would include formal instruction and periodic fire and emergency drills that simulate emergency, is needed. Furthermore, handling injuries should be included in the drills so that company personnel would learn how to handle emergencies and reduce the confusions during accidents.

The fire hydrants and deluge water spray system were inoperable after the explosion because the water main that supplied the system was broken at a flange above ground inside the substation. The safety and fire technician discharged about 2,000 lbs of dry chemicals from the firetruck in an unsuccessful attempt to extinguish the fire. Location of valves to isolate the fire main break were not known by personnel onsite, and they were required to wait for the arrival of the Solomon Volunteer Rescue Squad and Fire Department (SVRSFD) to extinguish the fire.

The reception, storage, vaporization, and transmission of LNG require unique materials and complex control systems. Although on-the-job training may be sufficient for normal operations, it is unlikely that such training will be sufficient to cope with emergencies. The Safety Board believes that only when operating personnel thoroughly understand the function, method of operation, failure modes, and corrective actions can they adequately respond to equipment casualties and other emergencies. This is clearly demonstrated by the institution of the emergency shutdown of the entire facility shortly after the explosion. The LNG controllers who initiated this shutdown testified that they reacted intuitively but were unfamiliar with what these shutdowns actually entailed and whether or not that was the correct action. Furthermore, they could not differentiate between the various types of facility shutdowns and determine which one would be appropriate for various emergencies. It would have been possible to cause a secondary accident at Cove Point by trapping LNG between two valves; as the LNG absorbs ambient heat, the accompanying pressure rise may be sufficient to rupture the piping system unless the pressure is relieved by the relief valves. Therefore, the Safety Board believes that Cove Point LNG controllers were not sufficiently trained to cope with emergency situations.

Title 49 CFR 191.5 requires immediate telephonic notification to the DOT at the earliest possible moment following the discovery of a leak which results in a death or personal injury requiring hospitalization; taking of any segment of transmission line out of service; resulted in gas ignition; or caused estimated damage to the property of the operator or others or both or a total of \$5,000 damage or more. In 1971 and again in 1978, the Department of Transportation published an interpretation of 49 CFR 191.5, Telephonic Notice of Certain Leaks, and advised that it meant notification within 1 to 2 hours. The Cove Point accident covered all five points requiring immediate telephonic notification, but the telephone call was not made until 7:50 a.m., 4 hours 25 minutes after

the accident. The telephone number used to report accidents of this type was not available at Cove Point. This delay in notification significantly delayed the arrival of the Safety Board investigator to the accident site. Early arrival to the accident site is important for preservation of evidence and accurate witness testimony.

The Safety Board is concerned that other LNG reception facilities with similar design could experience the same problem. Therefore, the National Transportation Safety Board recommends that the Columbia LNG Corporation:

Install an adequate means for detecting LNG vapors in all buildings and enclosures at Cove Point. If combustible gas indicators are used, ensure that they are properly located, tested periodically, and recalibrated. (Class II, Priority Action) (P-80-34)

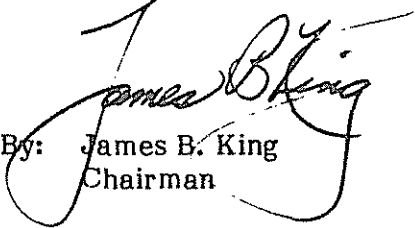
Revise the firefighting training for Cove Point personnel to include periodic fire and emergency drills. These drills should provide realistic training exercise. (Class II, Priority Action) (P-80-35)

Install isolation valves in the fire water mains to prevent the system from becoming compromised because of a break in any single part of the fire water system. (Class II, Priority Action) (P-80-36)

Post a diagram or other means to illustrate the locations of all firefighting equipment and systems, including the fire water mains and its isolation valves at key locations throughout the Cove Point facility. (Class II, Priority Action) (P-80-37)

Revise the emergency telephone list for Cove Point to include the Materials Transportation Bureau (MTB), Office of Operation and Enforcement, telephone number, and instruct employees in the importance of notifying MTB immediately of any accident that caused the death or personal injury requiring hospitalization; required the taking of any segment of transmission pipeline out of service; resulted in gas ignition; or caused an estimated damage to the operator or others or both or a total of \$5,000 or more. (Class II, Priority Action) (P-80-38)

KING, Chairman, DRIVER, Vice Chairman, McADAMS, and GOLDMAN, Members, concurred in these recommendations. BURSLEY, Member, did not participate.


By: James B. King
Chairman