

Log I-69

**NATIONAL TRANSPORTATION SAFETY BOARD  
WASHINGTON, D.C.**

ISSUED: April 23, 1984

Forwarded to:

Mr. Robert W. Grant  
President  
National Fire Protection Association  
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SAFETY RECOMMENDATION(S)

I-84-1 through -3

On August 12, 1983, a tank car loaded with dimethylamine <sup>1/</sup> located on an industrial railroad track at A. J. Chemicals in Benecia, California, began leaking product from its sample line. The leak, located close to the sample line valve near the top of the tank car, was detected at 3 p.m. by an employee of the chemical company. The owner of the chemical company was notified immediately, and he called the shipper of the product for instructions on how to handle the leak. He was unable to follow the instructions of the shipper because necessary equipment was not available, so he notified the Benecia Fire Department. The firechief quickly recognized the need for specialized assistance and requested assistance from the hazardous materials supervisor of the railroad which had transported the tank car to the chemical company and from the San Francisco Fire Department Hazardous Materials Team.

Based on the railroad hazardous materials supervisor's previous experience with leaks in sample lines, he brought with him a clamp designed specifically to stop such leaks temporarily. Soon after he arrived, the supervisor and three firefighters, all wearing chemical protective suits (CPS), climbed upon the tank car and installed the repair clamp over the leak in the sample line. About one-half hour later, the repair clamp began to leak and a second attempt was made to stop the leak. During this second exposure to the dimethylamine, the supervisor and firefighters began to experience problems with the face pieces on their CPS suits, such as melting or clouding, reduced visibility, and crazing which further reduced visibility. Leaks developed in the seams of the CPS suits. The face piece in one of the CPS suits worn by a firefighter shattered when he dropped about 3 feet while getting off the tank car, exposing him to the hazardous environment.

Because of the failures of the CPS suits, the on-scene commander prohibited further attempts by firefighters to stop the leak. The leak in the sample line finally was stopped by a contract hazardous materials cleanup company. No difficulties were experienced with the CPS suits used by the contractor, but these suits were exposed to the dimethylamine environment only for a short period. All CPS suits used in this emergency were made by the same manufacturer, but they were not of the same design.

1/ Dimethylamine is a corrosive and flammable gas shipped in pressurized containers.

Information available to the fire departments about the CPS suits led the departments to believe that the CPS suits were adequate for protecting their personnel within the hazardous dimethylamine environment. The failures experienced with the face pieces and the seams of these suits surprised not only the fire departments but also the contract company. These failures have caused the Safety Board to be concerned about the adequacy of current CPS suits to protect emergency response and contract hazardous material response personnel in environments involving hazardous materials.

The wording of the information provided with the CPS suits concerning chemical compatibility is not specific. Careful reading reveals that the information primarily relates to the permeability of the suit fabric when exposed to various chemicals. Little information is included concerning the safety aspects of the fabricated suit, such as the resistance to chemical vapors by the seams or the chemical compatibility of the face piece. The tenor of the information is that if the materials used in construction are compatible, so is the constructed suit.

In its investigation of the CPS suit failures during this emergency, the Safety Board contacted other fire departments and fire-related associations. Those contacted related many similar problems with CPS suits. Several fire departments reported firefighter injuries resulting from hazardous materials entering the CPS suits through seams. Others related their concern about firefighter injuries as a result of the face piece losing its transparency, or as a result of chemical vapors entering the CPS suit through cracks in the face piece, resulting in short-term or long-term exposure of emergency response personnel and others to health hazards. Moreover, the Safety Board learned that the U.S. Coast Guard, the Environmental Protection Agency, the U.S. Fire Administration, and the National Institute for Occupational Safety and Health have concerns about the adequacy of existing protective equipment used in chemical emergencies. Each has programs directed at improving certain aspects of these suits and at better defining the conditions under which they can be used safely.

The manufacture of CPS suits for firefighters is a relatively new enterprise for many manufacturers; in previous years the market was almost exclusively for the chemical process industry (CPI). However, unlike the CPI, firefighters do not know in advance to which of the many hazardous chemicals they may be exposed. Consequently, suits designed for a specific chemical exposure is not a viable option for firefighters because of the many chemicals in transportation and the high cost of CPS suits. Several of the agencies contacted by the Safety Board suggested ways to improve the performance of the CPS suits, such as coating the basic lens material of the face piece, using a multilayered lens, establishing standards for the testing and construction of CPS suits, and providing information with a CPS suit on its expected performance.

Except for the United States Army standards on material strength and vapor tightness of CPS suits, the Safety Board found that no standards currently exist for the manufacture or testing of CPS suits. Moreover, there appears to be no standard content or format established for the chemical compatibility information provided by manufacturers of these suits. However, it was learned that the American Society for Testing and Materials (ASTM) is working to develop a method of testing the vapor tightness of CPS suits, and upon completion of this work, it will recommend methods for performing prepurchase and field tests of CPS suits.

The Safety Board believes that standards are needed for the construction and testing of CPS suits and protective face masks used by emergency response personnel in the handling of transportation and other hazardous material emergencies. There are projects underway to improve the usefulness of CPS suits, but the efforts are not fully coordinated.

Because most fire departments, as well as many other emergency response agencies, look to the National Fire Protection Association (NFPA) for guidance concerning protective clothing, the Safety Board believes that the NFPA is the logical place for such standards to be developed.

Therefore, the National Transportation Safety Board recommends that the National Fire Protection Association:

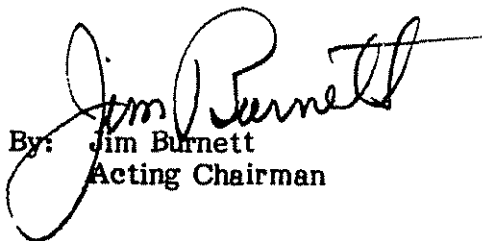
Develop and issue standards for the design and construction of chemical protective suits, including face pieces whether or not an integral part of a suit. (Class II, Priority Action) (I-84-1)

Assist the American Society for Testing and Materials F23.5 Committee in developing and issuing standards for both initial certification and periodic recertification of chemical protective suits. (Class II, Priority Action) (I-84-2)

Establish standards for both the content and format of chemical compatibility information which should be provided by manufacturers of chemical protective suits. (Class II, Priority Action) (I-84-3)

The National Transportation Safety Board is an independent Federal agency with the statutory responsibility "...to promote transportation safety by conducting independent accident investigations and by formulating safety improvement recommendations" (P.L. 93-633). The Safety Board is vitally interested in any actions taken as a result of its safety recommendations, and the Board would appreciate a response from you regarding action taken or contemplated with respect to the recommendations in this letter.

BURNETT, Acting Chairman, and GOLDMAN, BURSLEY, ENGEN, and GROSE, Members, concurred in these recommendations.

  
By: Jim Burnett  
Acting Chairman