



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: January 6, 1998

In reply refer to: P-97-13

Mr. Graham Midgley
President
Heath Consultants, Inc.
9030 Monroe Road
Houston, Texas 77061

About 8:30 a.m. on November 21, 1996, because of a propane gas leak, a commercial building in San Juan, Puerto Rico, exploded. Thirty-three people were killed, and more than 80 were injured.¹

The inadequacy of the training of the San Juan Gas Company (SJGC) employees contributed substantially to causing the explosion. Employees cannot do a proper leak survey or pinpoint a gas leak without knowing the lateral location of the gas pipes, the depth of the gas lines, and the depth at which the barholes should be made. For low-pressure propane/air systems, it is imperative that a crew first know the depth of the pipeline and then ensure that the barhole depths reach the pipe depth. The SJGC employees did not know the depth of the gas line and did not sink the barholes deeply enough.

The SJGC's training was inadequate in other ways. The company did not assess the performance of its trainees after they had been trained or document its training. The personnel files for the incident crewmembers did include certificates for various training courses, but the files did not indicate the content of the courses or whether the courses were part of a training plan.

The Safety Board assessed the development, conduct, and evaluation of training for the SJGC's employees as inadequate, particularly for the people who surveyed, located, and repaired leaks. The major deficiency was the lack of a front-end analysis of the training needed. A front-end analysis includes a job analysis, which is necessary to identify the tasks² that the holder of

¹ For more information, read Pipeline Accident Report—*San Juan Gas Company, Inc./Enron Corp. Propane Gas Explosion in San Juan, Puerto Rico, on November 21, 1996* (NTSB/PAR-97/01).

² A task is an action or function performed as part of a job. Tasks are usually readily observable and should be measurable for determining adequacy of performance.

the job must be able to do. Doing a job analysis would have identified the individual tasks related to the job, the number of people needed to perform the job, the tools and equipment necessary for performing the work, and any manuals, references, regulations, or company procedures the trainees were required to follow. Once a task is identified, it can be converted to a learning objective,³ or a goal that the trainee will achieve by taking training.

Learning objectives can be used to measure the effectiveness of the training. After fully describing the learning objectives, the course designer determines the appropriate course presentation options. Options can include computer-based training, on-the-job training, interactive video, slides, and other media, as well as the standard platform or lecture format. During this design phase, written testing and/or ways to assess student performance can be designed to reflect the agreed upon learning objectives. In this way, assurance is provided that all critical job tasks are identified and can be taught and tested.

After training, the trainee can be tested or another objective means of assessing training effectiveness can be used to determine whether the learning objectives have been met. The assessment would confirm that the trainee could successfully perform the tasks that have been identified as necessary to do the job. Therefore, the training has been successful and the trainee is prepared for the job. Not only does the use of learning objectives provide a way of assessing the effectiveness of training, it keeps the training focused on the tasks that the trainee actually has to be able to do in order to perform the job. Thus, a good front-end analysis of a trainee's job can save both time and money.

Therefore, the National Transportation Safety Board issues the following recommendation to Heath Consultants, Inc.:


Identify, when developing contracted training, the tasks for which the trainees must be trained and develop measures for assessing the job performance of the trainees and the effectiveness of the training. (P-97-13)

Also, the Safety Board issued Safety Recommendations P-97-5 to the U.S. Secretary of Transportation, P-97-6 through -8 to the Research and Special Programs Administration, P-97-9 and -10 to the Puerto Rico Public Service Commission, and P-97-11 and -12 to Enron Corp.

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" (Public Law 93-633). The Safety Board is vitally interested in any action taken as a result of its safety recommendations. Therefore, it would appreciate a response from you regarding action taken or contemplated with respect to the recommendation in this letter. Please refer to Safety Recommendation P-97-13 in your reply. If you need additional information, you may call (202) 314-6468.

³ A statement that describes what knowledge the students will have or what they will be able to do upon completion of training.

Chairman HALL, Vice Chairman FRANCIS, and Members HAMMERSCHMIDT, GOGLIA, and BLACK concurred in this recommendation.

A handwritten signature in black ink, appearing to read "J. Hall", written in a cursive style.

By: Jim Hall
Chairman