Log P-250

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

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Forwarded to:

Mr. Stan Mruk
Technical Director
Plastic Pipe Institute
355 Lexington Avenue
New York, New York 10017

SAFETY RECOMMENDATION(S)

P-84-17 and -18

At 11:15 a.m., c.d.t., on July 12, 1983, natural gas escaping under 60 pounds pressure from a crack in a butt fusion joint in a 2-inch plastic gas main entered an apartment building in Clear Lake, Iowa, exploded and then burned. Two Interstate Power Company employees were injured, one apartment building was destroyed, and the adjacent apartment building was damaged heavily. Damage was estimated at more than $1 million; none of the residents were injured or killed. 1/

According to the Plastic Pipe Institute and plastic pipe manufacturers, such as Dupont, Plexco, and Nipak, a butt fusion between two lengths of plastic pipe when properly made, should be as strong or stronger than the plastic pipe itself. A butt weld between two lengths of steel pipe carries the same strength definition, however, here the similarity ends. In the field, accurate, reliable, repeatable, nondestructive testing of steel butt welds can be readily and practically undertaken by X-ray, radioactive isotopes (gamma rays), and magna flux. The American Petroleum Institutes (API) Standards for Welding Pipelines and Related Facilities, API Std 1104, Section 6.0, Standards of Acceptability, and Section 8.0, Radiographic Procedure, set the standards of acceptability for size and type of weld defect, the requirements for producing acceptable radiographs, and the qualifications of the radiographers for the work. Over the years, these API standards have been improved to the point that today field radiographic inspection of butt welds on steel pipes, by qualified, motivated technicians, can be classified as a science. However, the field nondestructive tests for plastic pipe butt fusion cannot be classified as a science. The physical appearance of the fusion is the primary nondestructive field test method. However, the physical appearance test is valid only when all other procedures of squaring the pipe, heating the tool, applying the pressure, and holding the pipe have been rigidly adhered to.

During the annual fusion qualification tests given by Interstate to its pipefitters/operators wherein the employees' work was given a physical inspection followed by a destructive test, most of the persons passed both. However, one person's

1/ For more detailed information, read Pipeline Accident Report—"Interstate Power Company, Natural Gas Explosion and Fire, Clear Lake, Iowa, July 12, 1983" (NTSB-PAR-84/02).

work passed the visual inspection, but failed the destructive test; one person's work failed both the visual inspection and the destructive test; and one person failed the visual inspection and passed the destructive test. Interstate stated that all persons had to pass both aspects (visual inspection and destructive testing) before being allowed to fuse plastic pipe in actual field operation. The Safety Board is concerned that perhaps physical appearance of a butt fusion joint is more of an art than a science and that what looks good to one supervisor may not look good to another and, indeed, upon destructive testing, may fail. As to the July 12, 1983 accident, the report prepared by the testing laboratory stated that the external appearance of the failed butt fusion joint was good, but was a fusion weld wherein uniform fusion of the plastic pipe surfaces had not been completed around the pipe. The findings in this accident raise the question about the number of plastic butt fusion joints which may have been installed and have a good external appearance, but which in fact, may be substandard.

U.S. Department of Transportation data for the past year includes only one accident that has been attributed to joint failure in plastic pipe; however, the reporting form for pipeline accidents does not have a specific category for joint failure. Accidents involving joint failure in plastic pipe are reported under the "other" category, and joint failure may or may not be specified. Therefore, it is unlikely that the statistics accurately represent the true number of plastic pipe joint failures.

At least two other stress possibilities were present in this accident: (1) the fusion joint was placed in a bend in the pipe (the bend was not measured but was photographed when the pipe was excavated) and that subjected the weld to a bending stress; and (2) construction activity was conducted in the vicinity of the pipe after it had been installed (a sidewalk was laid over it, a swimming pool was constructed close to it, and a parking lot was built close to it). All of the construction activity was conducted with trucks loaded with material operating close to the pipe. These stresses may have contributed to the fusion failure, however, if the fusion had been ". . .as strong or stronger than the plastic pipe itself," the bend and construction activity should not have affected it and the accident may not have occurred.

On December 30, 1970, the Safety Board issued "Special Study of Effects of Delay In Shutting Down Failed Pipeline Systems and Methods of Providing Rapid Shutdown." 2/ Since then the Board has issued 33 safety recommendations as a result of 16 pipeline accident which involved failure to shut down pipelines in a timely manner. In the Introduction to the Special Study, the Safety Board stated:

> In almost all recent pipeline accidents, the delay in shutting down the failed pipeline system has resulted in an increased magnitude of catastrophe. Had the flow of gas or hazardous liquid been stopped soon after the initial rupture, the effects of many accidents would have been minimized or eliminated. With the ever increasing use of pipelines for natural gas and other hazardous materials and the proximity of these lines to expanding populated areas, it is imperative that systems and methods be developed and put to use which will provide for the rapid shutting down of failed pipeline systems.

The Safety Board concluded that:

2/ Special Study of Effects of Delay in Shutting Down Failed Pipeline Systems and Methods of Providing Rapid Shutdown (NTSB-PSS-71-1).

> By reducing the time required to shut down a failed pipeline system to minimize the loss of material, the hazardous effects to the public, to persons working near a pipeline, and to property can be minimized or eliminated. Equipment and procedures are currently available which, if utilized, could drastically reduce the shutdown delay cited in the accidents discussed in this study.

The Clear Lake accident is another illustration of the unfortunate consequences when failed pipeline facilities are not shut down in a timely manner. While Interstate has a formal, written plan for shutting down its gas facilities, the plan does not address specifically the rapid shutdown of small sections of pipeline, such as the one involved in this accident. Moreover the plan is given only to supervisory personnel and not to the employees who are the first to be dispatched to a gas leak site.

As a result of its investigation of a pipeline accident in Annandale, Virginia, on March 24, 1972, in which three persons died, one person was injured, two houses were destroyed, and a third house was badly damaged, 3/ the Safety Board recommended that the Office of Pipeline Safety (now the Research and Special Programs Administration) of the U.S. Department of Transportation:

> Amend 49 CFR 192 to require that each operator maintain a log which shows the receipt and handling of each leak or emergency report received. Information concerning the time that the report was first received, that a crew was first dispatched to the scene, that such a crew arrived, and that the condition was considered safe should be included. In addition, each pipeline operator should be required to analyze his performance in responding to gas leak emergencies and reports. Both the logs and the analysis should be made available to State agencies and the Office of Pipeline Safety. (Safety Recommendation P-72-42) (emphasis added)

It is important for gas companies to encourage reporting and to maintain an effective line of communication with the public since the public is the best source for reporting most gas odors/gas leaks. An effective leak response system must include the immediate logging of telephone calls about gas odors, the logging of the precise information given (date, time, location, and leak description), and the rapid dissemination of this information to the responding crew. Emergency-type telephone calls should have the highest priority and should be handled completely before attention is given to regular business matters. By so doing, the gas company not only can insure the rapid response to a complaint, but it can check on its own efficiency as to when the crew was dispatched, when the crew arrived, what conditions the crew encountered, and when the condition was rendered safe. Many gas companies tape record all incoming emergency-type telephone calls as a matter of record and as a means to assess their dispatching efficiency. Unfortunately, in this accident, there was no record of the first or second telephone calls from the apartment resident who reported the gas odor, no work order was printed giving the particulars of the leak in time for the serviceman to take with him when he responded, and there was no accurate record of the time the serviceman arrived at the leak site. Undisciplined handling of gas odor or gas leak telephone calls, as was apparent in this accident, decreases the speed and effectiveness in the response to those calls.

3/ Pipeline Accident Report--"Washington Gas Light Company Natural Gas Explosions at Annandale, Virginia, March 24, 1972 " (NTSB-PAR-72-4).

Since October 14, 1970, the Safety Board has issued 88 pipeline safety recommendations to the pipeline industry and to the Research and Special Programs Administration of the U. S. Department of Transportation regarding the development of written emergency procedures to be implemented during pipeline emergencies. These recommendations have addressed a range of suggestions from the receipt and rapid processing of telephone calls reporting gas leaks, guidelines for the first person responding to the accident site, the ventilation of gas-filled buildings, the evacuation of residents from buildings, to the rapid shutdown of the failed facility. The Safety Board's concern is twofold: first, a gas company must have complete, written, emergency plans; and second, gas company employees who may be called upon to respond to emergencies must be familiar with these emergency plans to implement them consistently, promptly, and effectively.

Therefore, the National Transportation Safety Board recommends that the Plastic Pipe Institute:

> Urge its member companies to emphasize to users of plastic pipes the importance of explicitly following recommended fusion procedures. (Class II, Priority Action) (P-84-17)
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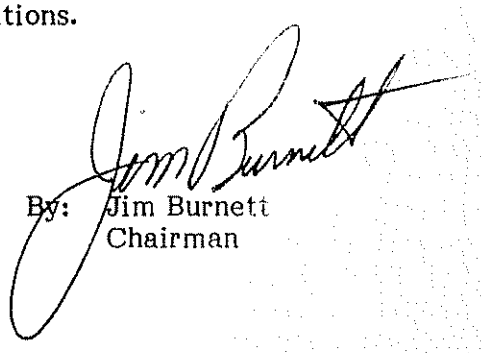
> Urge its member companies to cooperate with the Gas Research Institute in the development of nondestructive equipment testing capable of detecting inadequately fused butt, saddle, and socket fusion joints in the field. (Class II, Priority Action) (P-84-18)

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 would appreciate a response from you regarding action taken or contemplated with respect to the recommendations in this letter.

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



By: Jim Burnett
Chairman