

pressure of 20 p.s.i.g. to migrate under and into the affected house at 2109 Amanda Street.

The distance between houses was large enough so that almost all of the blast and ensuing fire were confined to 2109.

The leaking gas from the four other failures posed a hazard, but Lone Star, forewarned by the explosion, was able to detect these breaks and repair them before additional accidents occurred.

A review of the ASME guidelines, specifically concerning heat fusion joints (849.394) and prevention of damage due to external loading or settling of backfill (849.52), indicates that although Lone Star complied with them in general, the guidelines were not implemented thoroughly enough to prevent the accident. Lone Star did not give proper consideration at the time of the system's installation to both the soil heaving problem and the planned construction work on Amanda Street.

IV. CONCLUSIONS

The National Transportation Safety Board concludes that:

1. The Lone Star construction specifications for the installation of plastic pipe were not specific in detailing the type, size, and kind of reinforcing sleeve to be used in service saddle-tapping nipple fusion welds.

2. The plastic gas distribution system which suffered failures in this area was installed improperly and was not adequately inspected during construction.

3. The newly installed gas distribution system had been subjected to repeated loads and stresses by the heavy equipment which had operated directly over it while widening the road and laying curbs and sidewalks.

4. The plastic service connection was weakened additionally by improper fusion and by an incorrect reinforcing sleeve. The connection failed under the stress applied to it by the rain-soaked, heaving soil.

5. The leaking gas which migrated up and seeped into the house at 2109 Amanda Street

came from a break in the plastic service line which served the house across the street.

V. PROBABLE CAUSE

The National Transportation Safety Board determines that the probable cause of the explosion and fire was the ignition of an accumulation of natural gas which had migrated under a pressure of 20 p.s.i.g. from a failed plastic service saddle-tapping nipple connection into the house. Contributing to the failure of the connection were its improper installation, previously imposed load stresses which resulted from the repeated operation of heavy construction equipment over the connection, and heavy rainfall which caused the soil to exert pressure on the pipe.

VI. RECOMMENDATIONS

The National Transportation Safety Board recommends that:

1. The Office of Pipeline Safety of the Department of Transportation:

Undertake a study in the field of heat fusion of plastics and, as a result of that study, issue regulations for the heat-fusion welding of plastic piping systems in 49 CFR Part 192, Fusion Welding, in as much detail as is contained in the existing welding specification for steel piping systems. (Recommendation No. P-72-63).

2. The American Society of Mechanical Engineers Gas Piping Standards Committee:

(a) Develop guidelines for the use of reinforcing sleeves at plastic service line-gas main connections and incorporate them in the "Guide for Gas Transmission and Distribution Piping Systems." (Recommendation No. P-72-64).

(b) Develop guidelines for the requirements concerning reinforcement, special backfill, and tamping of mains and service lines where their installation will be subjected to external forces due to anticipated road, curb, or sidewalk construction, as well as unstable soil conditions. (Recommendation No. P-72-65).

5. The Lone Star Gas Company:

(a) Revise its plastic pipe construction specifications to include the specific type and size reinforcing sleeve to be used with each type of service saddle-tapping nipple connection. (Recommendation No. P-72-66).

(b) Educate its construction inspectors as to the necessity for correct installation of plastic piping systems. (Recommendation No. P-72-67).

(c) Undertake a program acceptable to the Railroad Commission of the State of Texas,

to inspect on a random sample basis the plastic service line-gas main connections, similar to those at the accident site to determine the present condition of and the existing stress on the piping. The results of this program will determine the action to be taken on the other installations in the Lone Star system. Copies of these test results should be forwarded to the Railroad Commission of the State of Texas and the Office of Pipeline Safety of the Department of Transportation (Recommendation No. P-72-68).

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JOHN H. REED
Chairman
/s/ FRANCIS H. McADAMS
Member
/s/ ISABEL A. BURGESS
Member
/s/ WILLIAM R. HALEY
Member

Louis M. Thayer, Member, was not present and did not participate in the adoption of this report.

December 13, 1972