

tion, which applied a bending force to the pipe in an area weakened by graphitization.

Contributing to the explosion were the failure of the gas company to shut off the flow of gas to the leak site and the inadequate efforts of the gas-company personnel to prevent the ignition of the leaking gas detected in the building.

RECOMMENDATIONS

The National Transportation Safety Board recommends that:

1. The Office of Pipeline Safety of the Department of Transportation:
 - (a) Revise 49 CFR 192.741 to require pipeline operators to telemeter gas pressure or flow data in such a way as to insure prompt warnings of significant system failures shown by pressure or flow changes. The type and location of the data points should be considered on an individual basis and should include single-fed systems serving substantial numbers of customers. (Recommendation No. P-74-16)
 - (b) Define what constitutes an emergency and provide clarification of the requirements of emergency procedures under 49 CFR 192.615, Emergency plans. (Recommendation No. P-74-17)
 - (c) Require that designated emergency valves be the valves closed initially when a section of main is required to be isolated in an emergency. (Recommendation No. P-74-18)
2. The American Society of Mechanical Engineers Gas Piping Standards Committee:
 - (a) Develop guidelines for the use of telemetering on gas distribution systems so that system failures can be promptly detected. (Recommendation No. P-74-19)
 - (b) Expand the guidelines on the prevention of accidental ignition, to provide for more comprehensive guidance to pipeline operators when gas is detected in buildings and structures. The guidelines should include such subjects as ventilation of structures, prohibition of electrical switch operation, and occupant evacuation. This work should be coordinated with the guidelines currently being developed

concerning the action to be taken by the first gas company employee arriving at the scene of an emergency. 8/
(Recommendation No. P-74-20)

3. The Missouri Public Service Company:

- (a) Expand its emergency procedures to include the actions to be taken in all types of emergencies. (Recommendation No. P-74-21)
- (b) Install telemetering equipment at the Clinton and other town border stations, so that system failures can be promptly detected. (Recommendation No. P-74-22)
- (c) Expand its formal training program to provide employees who respond to reported leaks with the knowledge and techniques required to assist them in handling emergency situations. (Recommendation P-74-23)
- (d) Take remedial action to reduce the possibility of breakage of cast-iron mains. This action should include replacement of those sections of cast-iron main susceptible to failure. (Recommendation P-74-24)
- (e) Develop a sectionalizing program of its high-pressure distribution system so that preplanned procedures are available to isolate any section of its system in an emergency. (Recommendation No. P-74-25)
- (f) Train and equip all appropriate radio-equipped field personnel (including electric servicemen) to locate and operate main line valves in emergencies. (Recommendation No. P-74-26)
- (g) Provide valve location and other necessary information to dispatchers in radio contact with servicemen, supervisors, and repair crews, so that emergency efforts can be expeditiously coordinated. (Recommendation No. P-74-27)

8/ See NTSB Recommendation P-72-48 contained in NTSB-PAR-72-4.