

- 6. It is difficult to determine the extent of external corrosion in cast-iron pipe by the visual examination required by 49 CFR 192.459.
- 7. Since AGL records did not indicate the frequency and causes of failures of cast-iron mains, it was difficult for AGL to assess the problem accurately and plan remedial action.

V. PROBABLE CAUSE

The National Transportation Safety Board determines that the probable cause of the explosion was the ignition of gas that leaked from a cast iron main cracked by uneven soil settlement which applied a bending force to the pipe in an area weakened by graphitization.

Contributing to the explosion was the failure by the gas company to check for gas in the building, to shut off the flow of leaking gas, and to notify police and fire officials.

VI. RECOMMENDATIONS

The National Transportation Safety Board recommends that:

- 1. The Office of Pipeline Safety of the Department of Transportation:
 - (a) Improve the accident-reporting requirements in order to obtain a better understanding of the causes of failures of cast-iron mains. (Recommendation No. P-73-37)
 - (b) In cooperation with the various State regulatory agencies, determine the degree of nationwide compliance with 49 CFR 192.615, written emergency procedures, and take enforcement action accordingly. (Recommendation No. P-73-38)
 - (c) In cooperation with the various State regulatory agencies, encourage gas distribution operators to review the factors that cause failures in cast iron mains in their systems, and to take necessary action to reduce the hazard to the public. (Recommendation No. P-73-39)
 - (d) Give additional regulatory consideration to the effects of graphitization on the resistance of cast-iron mains to external loads. Localized and general graphitization should be defined. (Recommendation No. P-73-40)

PAR-73-3

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

- (a) Develop criteria which can be used by gas distribution operators for reducing the potential hazards from breaks in cast-iron mains. The criteria should consider replacement or repair of mains, based on pipe size, graphitization, external loads, traffic, soil condition and stability, and gas pressure. (Recommendation No. P-73-41)
- (b) Develop guidelines for determining the extent of graphitization of cast-iron pipe by means of visual examination, as required in 49 CFR 192.459, and the effects of such graphitization on possible future leaks or fractures. (Recommendation No. P-73-42)

3. The Atlanta Gas Light Company:

- (a) Prepare written emergency procedures and acquaint appropriate operating and maintenance employees with the procedures. (Recommendation No P-73-43)
- (b) Improve its record-keeping system so that the number and causes of cast-iron main breaks can be readily obtained. (Recommendation No. P-73-44)
- (c) Take whatever remedial action is necessary 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 No. P-73-45)
- (d) 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 P-73-46)