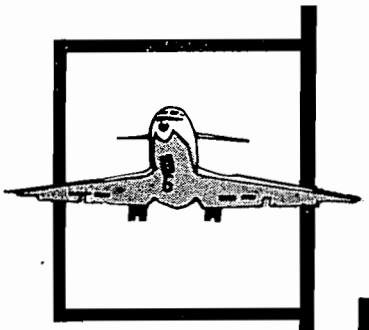

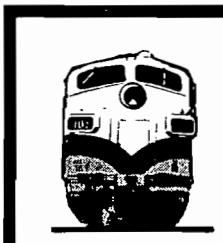

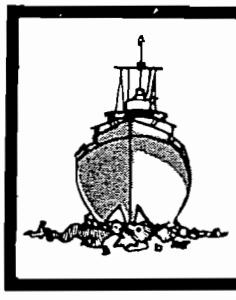

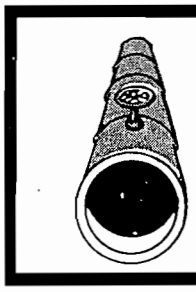

NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

PIPELINE ACCIDENT REPORT

GAS SERVICE CO.
EXPLOSION AND FIRE
LONDON, KENTUCKY
JANUARY 16, 1979

NTSB-PAR-79-2

UNITED STATES GOVERNMENT

TECHNICAL REPORT DOCUMENTATION PAGE

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16.Abstract

At 9:30 p.m. e.s.t., on Tuesday, January 16, 1979, natural gas which had escaped from a large corrosion hole in a 7-inch steel gas main and had accumulated in several buildings in a downtown business section of London, Kentucky, exploded and then burned. Five buildings were destroyed, two adjacent buildings were damaged extensively, windows within a five-block radius were shattered, and one truck was damaged. Two persons were injured slightly.

The National Transportation Safety Board determines that the probable cause of the accident was the ignition of an accumulation of natural gas which had leaked from an existing corrosion hole in a 7-inch steel gas main when the pressure was increased suddenly from 4 ounces to 17 psig in one step. Contributing to the accident was the failure of gas company personnel to conduct an adequate leak survey, using combustible gas indicators (CGI), and to check adjacent sewer manholes during the period the gas pressure was increased. A possible source of ignition was a spark from an electric motor in a beverage cooler.

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Pipe corrosion; uprating; written procedures; combustible gas indicator; sewer manhole gas check; personnel evacuation; 7-inch diameter bare steel gas main; area gas check; sudden pressure increase.	This document is available to the public through the National Technical Information Service, Springfield, Springfield, VA 22151

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NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C. 20594

PIPELINE ACCIDENT REPORT

Adopted: August 16, 1979

GAS SERVICE COMPANY, INC.
EXPLOSION AND FIRE
LONDON, KENTUCKY
JANUARY 16, 1979

SYNOPSIS

On Wednesday, January 10, 1979, personnel employed by the Gas Service Company, Inc., began installing regulators to increase the gas pressure in a downtown business section of London, Kentucky. The 7-inch-diameter bare steel gas main was to be uprated from 4 ounces to 17 psig pressure. Personnel continued through the weekend and repaired some leaks where detected.

At 9:30 p.m. e.s.t., on Tuesday, January 16, 1979, natural gas, which had escaped from a large corrosion hole in the 7-inch steel gas main and had accumulated in several buildings nearby, exploded and then burned. Five buildings were destroyed, two adjacent buildings were damaged extensively, windows within a five-block radius were shattered, and a truck was damaged. Two persons were injured slightly.

The National Transportation Safety Board determines that the probable cause of the accident was the ignition of an accumulation of natural gas which had leaked from an existing corrosion hole in a 7-inch steel gas main when the pressure was increased suddenly from 4 ounces to 17 psig in one step. Contributing to the accident was the failure of gas company personnel to conduct an adequate leak survey, using combustible gas indicators (CGI), and to check adjacent sewer manholes during the period the gas pressure was increased. A possible source of ignition was a spark from electric motor in a beverage cooler.

INVESTIGATION

The Accident

The Gas Service Company, Inc., (gas company) a subsidiary of the Delta Natural Gas Company of Winchester, Kentucky, had experienced an increased demand for gas in the downtown section of London, Kentucky. The gas company decided to increase the gas pressure into this area by inserting some new 2-inch polyethylene plastic pipe into an old, existing 7-inch bare steel gas main and reconnecting the 2-inch plastic pipe into the remainder of the 7-inch steel gas main for service to the rest of its customers. Gas company personnel began the work on January 10, 1979, by turning off the gas to install a regulator at each customer's meter. The regulator was to reduce the pressure from 17 psig to 4 ounces [1/] on the customer's side of the meter. The regulator orifices were removed so that they could operate at 4 ounces of pressure while the uprating was taking place. The orifices were to be replaced when the gas main became operational at 17 psig. Gas was returned to the customers at 4 ounces of pressure, and the work was continued.

Gas company personnel commenced work at Hill Street where the 7-inch gas main was connected through a regulator to a 3-inch main to provide a loop in the low-pressure system. (See figure 1.)

On Friday, January 12, 1979, gas company personnel turned off the valves at the newly installed regulators and then increased the pressure on the 7-inch bare steel gas main from 4 ounces to 17 psig. The workers then returned to each regulator, replaced the previously removed orifice, and began relighting procedures [2/] inside each building served by gas. One worker walked over the area to check for leaks. He did not use a combustible gas indicator (CGI) but relied upon his nose to detect the odor of gas. Although he did not check any sewer manholes, he detected two leaks: one at the corner of 5th and Main Streets -- gas was seen bubbling through standing water -- and a smaller one in the alley behind 5th Street. (See figure 1.)

To stop the first leak, the repair crew used an 8-inch clamp and large pieces of rubber gasket material to fit the 7-inch gas main. The second leak was repaired in the same manner on the following day, January 13, 1979. Gas at 17 psig was in the system throughout the weekend; therefore, no customers were without service.

1/ Four ounces equals one quarter psig.

2/ Relighting procedures involve turning the gas back on at the meter/regulator, bleeding air from the gas piping inside the building involved, relighting the pilot of all connected appliances, and testing to see that all gas burning units are functioning properly before gas personnel leave.

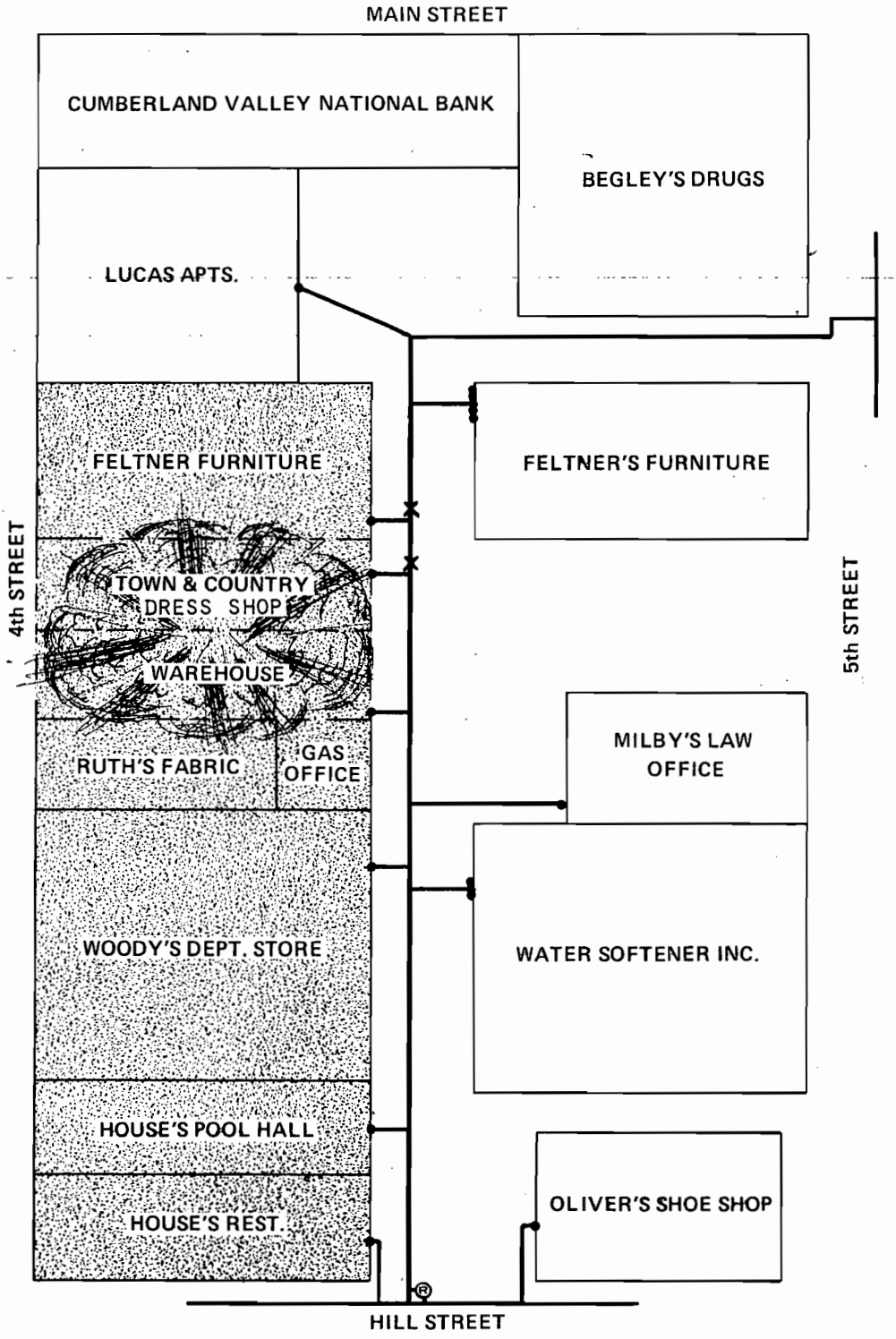

Figure 1. Plan of the accident site.

On Monday, January 15, 1979, service was again interrupted to 28 customers on the 7-inch gas main. A 2-inch polyethylene plastic pipe was inserted where the leaks had been detected--in the area of 5th and Main Streets. This was done in lieu of digging up the street and replacing the 7-inch gas main. The 2-inch plastic gas main was pressure tested to 90 psig for 15 hours before it was reconnected to the 7-inch steel gas main where it turned down the alley toward Hill Street. Pressure throughout the 7-inch steel gas main and the 2-inch plastic gas main was returned to 17 psig, and the customers' pilots were relit. One worker checked the uprated system for leaks by walking over the area, but no CGI was used, and no sewer manholes were checked.

On Tuesday, January 16, 1979, customer light-up continued, and gas odor complaints were received. At one location, the Lucas Apartments, (see figure 1) an undetermined odor was checked by gas company personnel by smell alone; no CGI was used. Outside the building, however, a reading of 30 percent of the lower explosive level (LEL) was obtained by using a CGI from a small drain under a stoop in the rear. The service line was disconnected to the building, and 1 hour later the LEL reading had dropped to 20 percent in the same location.

While gas company personnel continued the relighting procedures, they smelled gas around a meter at the Feltner Building. They stripped out the service line about 2 feet toward the gas main and soap tested it, but they did not detect a leak. The basement of the Town and Country Dress Shop was checked for gas using a CGI, but no leaks were detected. After a leak was detected on an unused service line to a restaurant next to Woody's Department Store, the service line was disconnected. The gas company personnel then filled the open excavation and left.

At 9:30 p.m., Tuesday, January 16, 1979, a truckdriver, operating eastbound on 4th Street, witnessed an explosion, but no fire, in the Town and Country Dress Shop. The truck engine stalled, and as the truck continued to roll downhill the driver witnessed a second, much larger explosion, followed by an intense fire in the warehouse. No persons were on the streets, and the truckdriver did not notice any gas odors. As a result of the two explosions and ensuing intense fire, five stores on 4th Street were destroyed, two adjacent buildings were damaged severely, windows within a five-block radius were shattered, and a truck was damaged. (See figures 2 through 5.) No one was killed, and the truckdriver was injured only slightly. Later, a person watching the fire fell and broke her ankle. Persons living in apartments on the top floors of the Lucas Building and Woody's Department Store escaped injury. The responding fire departments were both effective and successful in evacuating these people.

Figure 2. Explosion and fire, London, Kentucky.

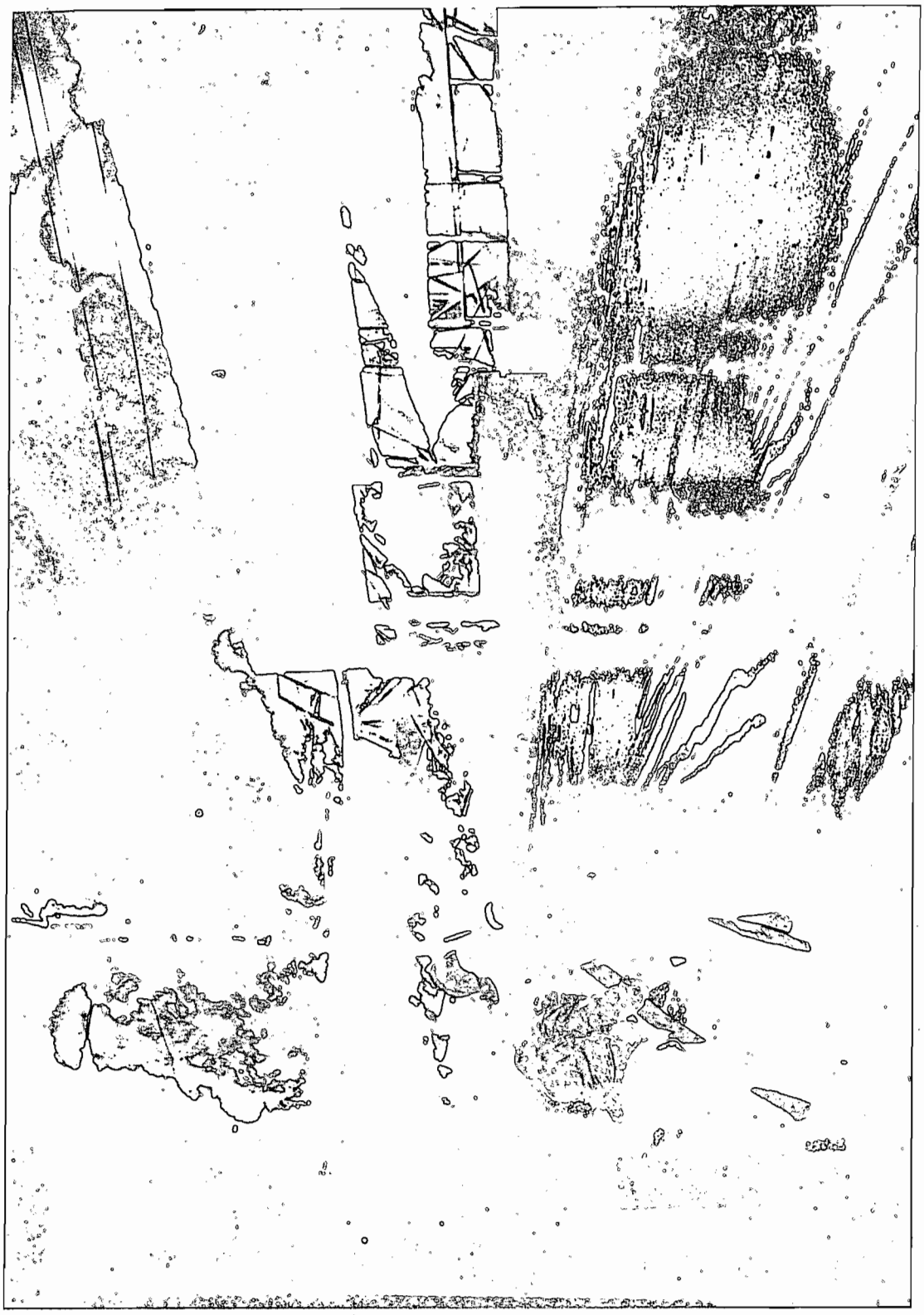

Figure 3. Explosion and fire, London, Kentucky.

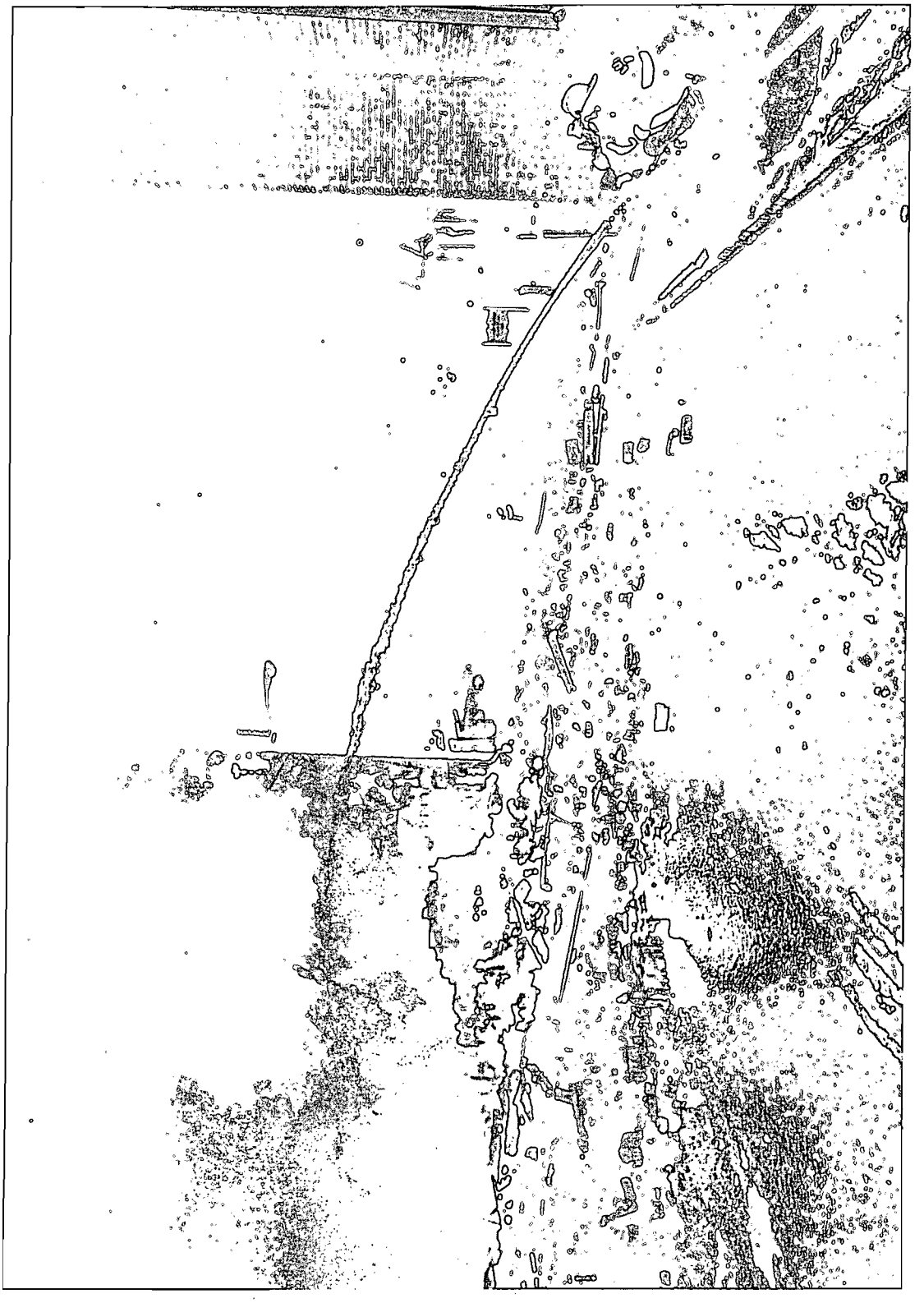

Figure 4. Explosion and fire, London, Kentucky.

Figure 5. Overall destruction, London, Kentucky.

Injuries to Persons

	Injuries	Operating Personnel	Bystanders	Other
Fatal	0	0	0	0
Nonfatal	2	0	1	1

Damage to Pipeline

After the accident, gas was turned off within 10 minutes to 28 customers in the affected area. On January 18, 1979, the 7-inch gas main was pressure-tested using two, 2,000 psig pressure, 301 cubic feet capacity nitrogen bottles. No pressure could be built up by this means, and an air compressor with a capacity of 120 cubic feet of air per minute at 90 psig pressure was utilized. With the air compressor operating at full capacity, 10 psig was the maximum pressure that could be attained in the 7-inch gas main. When the compressor was shut down, the pressure in the 7-inch gas main decreased rapidly to 0 psig.

Personnel Information

The local manager had been employed by the Gas Service Company, Inc., for 15 years. He had gained practical experience having worked previously on several uprating projects.

Pipeline System

The 7-inch steel pipe was installed in 1930 and 1931 by a privately owned gas company, which was purchased by the Gas Service Company, Inc., on October 1, 1977. The 7-inch-diameter pipe was purchased secondhand, and it had been used previously as well casing. The pipe was installed without any external coating, and no cathodic protection by either anodes or rectifiers was employed from the time of its installation to the time of the accident. The gas company had never conducted a corrosion survey on the system in an effort to determine what areas, if any, were being attacked by corrosion. (See figure 6.) No records were kept pertaining to its manufacturer or its specification. Its wall thickness, measured in an area of no corrosion, was determined to be .250 inch. The gas company had designated the maximum allowable operating pressure (MAOP) of the pipe as "unknown." Up to the time of the pressure uprating, the pipe had been operated at 4 ounces of pressure. The individual lengths of pipe were fastened together by mechanical couplings. At the leak site, the pipeline was covered by 57 inches of well compacted dirt.

The gas company did have written operation, maintenance, inspection, and construction procedures, but it did not have any written procedures for the uprating of its existing facilities. The London, Kentucky, branch manager of the gas company formulated the uprating plan on his own and directed his personnel orally in the uprating process.

Meteorological Information

At the time of the accident, the weather was cloudy, the temperature was 47° F, and the wind was from the south at 5 mph. There had been no precipitation for the past 24 hours.

Fire

The first explosion produced no fire. The second explosion was followed by a hot, gas-fueled fire, which continued for 10 minutes until the gas was shut off to the leak site and the gas accumulation had been consumed. The fire continued to burn, fueled by the wood and other burnables torn loose by the explosions. All fire was extinguished by 11:45 p.m.

Survival Aspects

A tractor, semitrailer was passing by the Town and Country Dress Shop when the first explosion occurred. The blast stalled the truck engine, but the driver, unhurt at that time, rolled the truck down the hill. As the truck moved in front of the warehouse, the second, more intense explosion occurred, causing minor injuries to the driver and minor damage to the vehicle. A following truck had to stop at the intersection of 4th and Main Streets because of debris from the explosions. Later, a person in the crowd, which had gathered to watch the fire, tripped and broke her ankle.

Tests and Research

After the accident, the bare steel pipe throughout the entire alley was replaced with 2-inch plastic pipe because of its corroded condition. Two sections of the failed pipe -- the piece with the 1-inch-diameter corrosion hole and the piece with the two smaller corrosion holes -- were sent to a metallurgical laboratory for analysis. Metallurgical analysis confirmed that the pipe was steel and that the 1-inch-diameter hole was caused by external galvanic action; no internal corrosion was noted. The 1-inch-diameter hole and the two smaller corrosion holes were caused by localized galvanic action; the rest of the pipe appeared to be in good condition.

Other Information

After the accident, the 7-inch gas main was isolated from the rest of the system, and a backhoe was used to strip out the pipe in the alley behind the destroyed buildings. A corrosion hole about 1 inch in diameter was found in the pipe in the alley behind the Town and Country Dress Shop. A sanitary sewerline was located less than 1 foot from the corrosion hole; the sewerline had a hole in it. (See figures 6 and 7.) Two other smaller corrosion holes were located in the pipe 11 feet west and behind

Figure 6. Broken sewerline below corrosion hole leak.

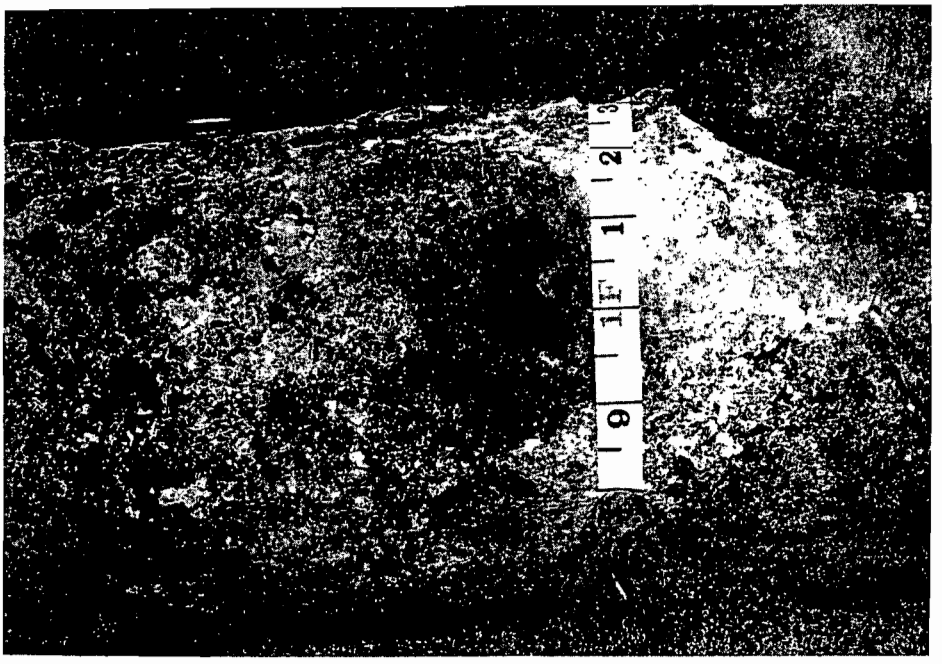

Figure 7. Corrosion hole in the pipe.

the Feltner Furniture Store. The ground around the larger corrosion hole behind the Town and Country Dress Shop was white in appearance and quite dry. The soil in the rest of the excavated area was moist.

Smoke was introduced into the hole in the sewerline near the large corrosion hole in an attempt to simulate the path of the leaking gas. The smoke flowed rapidly through the sewer leads, back into the destroyed buildings, and out of the standpipes and other openings in those buildings. A large volume of smoke escaped from an empty commode in the warehouse. The basement wall between the warehouse and the Town and Country Dress Shop had ventilation openings for air circulation.

A beverage cooler was located in the debris at the rear of the Town and Country Dress Shop. It was the only electrical appliance reported to be in operation at the time; no other source of ignition was detected.

The Federal regulations for corrosion control and for uprating natural gas pipelines, 49 CFR Part 192, specify the following:

192.453 General

Each operator shall establish procedures to implement the requirements of this subpart. These procedures including those for the design, installation, operation and maintenance of cathodic protection systems, must be carried out by, or under the direction of a person qualified by experience and training in pipeline corrosion control methods.

192.457 External corrosion control: buried or submerged pipelines installed before August 1, 1971.

(b) Except for cast-iron or ductile iron, each of the following buried or submerged pipelines installed before August 1, 1971, must not later than August 1, 1976, be cathodically protected in accordance with this subpart in areas in which active corrosion is found.

* * * *

(3) Bare or coated distribution lines. The operator shall determine the areas of active corrosion by electrical survey, or where electrical survey is impractical, by the study of corrosion and leak history records, by leak detection survey or by other means.

Subpart K -- Uprating

192.553 General requirements.

(a) Pressure increases. Whenever the requirements of this subpart require that an increase in operating pressure be made in increments, the pressure must be increased gradually, at a rate that can be controlled, and in accordance with the following:

(1) At the end of each incremental increase, the pressure must be held constant while the entire segment of pipeline that is affected is checked for leaks.

(c) Written plan. Each operator who uprates a segment of pipeline shall establish a written procedure that will ensure that each applicable requirement of this subpart is complied with.

* * * *

192.557 Uprating: Steel pipelines to a pressure that will produce a hoop stress less than 30 percent of SMYS: plastic, cast iron, and ductile iron pipelines.

* * * *

(b) Before increasing operating pressure above the previously established maximum allowable operating pressure, the operator shall-

(1) Review the design, operating, and maintenance history of the segment of pipeline:

(2) Make a leakage survey (if it has been more than 1 year since the last survey) and repair any leaks that are found....

* * * *

(6) If the pressure in mains or service lines, or both, is to be higher than the pressure delivered to the customer, install a service regulator on each service line and test each regulator to determine that it is functioning. Pressure may be increased as necessary to test each regulator, after a regulator has been installed on each pipeline subject to the increased pressure.

(c) After complying with paragraph (b) of this section, the increase in maximum allowable operating pressure must be made in increments that are equal to 10 psig or 25 percent of the total pressure increase, whichever produces the fewer number of increments. Whenever the requirements of paragraph (b)(6) of this section apply, there must be at least two approximately equal incremental increases.

The gas company had comprehensive corrosion control standards incorporated in its "Plan of Operation, Inspection and Maintenance and Construction Manual." (See appendixes A through C.) These standards were prepared by a professional corrosion engineering company. The parent company also had corrosion standards in its "Operation Manual," a significant section of which appears in appendix B. However, these corrosion control standards were never utilized to protect the 7-inch bare steel gas main which failed.

The gas company did obtain the services of a corrosion engineer 4 months before the accident to implement a corrosion control program. In addition, shortly before this accident the gas company recently implemented a 3-year system improvement program to replace its unprotected steel pipe with plastic pipe. The 3-year improvement program was to be system-wide and was to include other subsidiary companies owned by the Delta Natural Gas Company. The work was planned on a worst-case-first basis; those systems or portions thereof, which were the oldest, which had the worst leak records, or which required more capacity were given priority over other sections.

The gas company personnel in London, Kentucky, were few in number but had worked together and had received on-the-job training for the most part; they had not received any training or written instruction in uprating. The only formal training was obtained by sending some of their personnel to a 2-day seminar conducted by the Materials Transportation Bureau of the Department of Transportation. The manual used by the seminar, "Safety Requirements for Gas Pipeline Systems," was the only source of material used for uprating by the gas company. The seminar dealt more with the philosophy and theory of pipeline practices than the specifics. "The American Society of Mechanical Engineers Guide For Gas Transmission and Distribution Piping Systems, Subpart K - Uprating," goes into detail concerning uprating; this guide was not used by the gas company. The gas company's own operation, maintenance, inspection, and construction manuals did not contain any materials on uprating.

A written plan for the specific uprating project in London, Kentucky, had never been made and the gas company's upper management had never reviewed the uprating procedures that were used.

ANALYSIS

Corrosion

The condition of the bare, 7-inch-diameter steel gas main indicated that active corrosion had existed for a considerable time period. A complete leakage survey would have indicated this condition before the system was uprated. The bare steel pipe, which originally had been used as well casing for an unknown period of time, had been in the gas company service for 48 years; during all of this time, it had never been cathodically protected against corrosion. The gas company, to comply with Federal regulations as well as to follow its own corrosion control standards, should have surveyed the system and then applied the necessary cathodic protection before it began the uprating.

Uprating Procedure

The uprating was undertaken without any written procedures: either general ones, detailed by 49 CFR 192.605(d) for the conversion of a low-pressure distribution system to higher pressure or a specific written plan which is required by 49 CFR 192.553(c). The company did rely upon the Department of Transportation, Transportation Safety Institute publication, "Safety Requirements for Gas Pipeline Systems, as its source of information used in uprating, but it did not institute the suggested program. Instead, the procedures followed were formulated by the local manager who had practical experience but did not document or obtain review of approval by higher management. Review and consideration of such a written procedure might have resulted in the selection of alternate choices, such as scheduling work during favorable weather to avoid the necessity of maintaining service. Then the company could have replaced the 7-inch steel main or inserted the 2-inch plastic pipe in it before increasing the pressure.

Preparation for the uprating was inadequate. Too much reliance was placed on a 5-month old flame ionization survey which the gas company had completed in August 1978. At that time, leaks detected were reported to have been repaired, but the sewer manholes were not surveyed. The sewer manhole survey of gas leakage is important because escaping gas is often readily detected in manholes. In many cases, the sewerlines and gaslines run parallel and gas leakage can thus migrate into and accumulate in the sewers. Carefully done, a sewer manhole survey (and other manholes, such as below ground telephone facilities) together with an aboveground flame ionization survey and an inspection for dead or dying vegetation can provide good assurance of a leak-free system.

Customer service was interrupted briefly on January 10, 1979, while the gas company personnel installed regulators to handle the proposed gas pressure increase. After the regulator orifices were removed, customer service was restored at 4 ounces of pressure while the uprating was taking place. Two days later, the pressure was increased to 17 psig.

The pressure on the 1-inch-diameter corrosion hole was increased 68 times, from 1/4 psig before the accident to 17 psig. Before the accident, 57 inches of well-compacted dirt had covered the hole and had contained the gas at 1/4 psig. If the gas company personnel had increased the pressure from 1/4 psig to 8 psig, held the pressure constant (or tried to), and conducted a leak detection survey over the affected area, including a thorough check of manholes, gas leakage might have been detected. In addition, if they had monitored the gas pressure on the gas main, they might have detected the first signs of a pressure loss indicating leakage. Even if this first uprate from 1/4 psig to 8 psig did not produce any significant leakage, the second increase from 8 psig to 17 psig would probably have done so. The failure by the gas company personnel to institute a two-step increase, with monitoring after each pressure rise, was not consistent with prescribed minimum Federal safety standards.

The lack of formal training in uprating and the lack of specific written uprating instructions taken from the ASME guide were serious management oversights. If the gas company personnel employed in this uprating had been properly trained and had specific written uprating procedures to follow, the leak probably would have been detected and repaired before the accident occurred.

The 17 psig pressure was left on the service line through the weekend. Gas company personnel conducted walking surveys without using a CGI, and they did not check sewer manholes. Federal regulations, as well as the gas company's standards which require "a manhole and street opening survey..." and "a building survey... in the major business area..." were not followed.

On Monday, customer service was interrupted when the remaining plastic pipe was inserted in a section of the 7-inch steel gas main, and pressure in the line was reduced to 0 psig. That evening the pressure was increased to 17 psig. In a 2- to 3-day period, the soil packing around the corrosion holes varied from 1/4 to 17 psig several times; this pressure variation knocked out or partially knocked out the soil plug in the corrosion holes, thus allowing gas to enter the sewer, back up into the buildings, and ignite.

The Safety Board concludes that underlying the human errors in this accident was the basic failure of management to provide adequate procedures, training, and instruction.

CONCLUSIONS

Findings

1. The 7-inch-diameter bare steel gas main had not been cathodically protected against corrosion nor adequately surveyed to determine areas of active corrosion as required by 49 CFR 192.453, 49 CFR 192.457, and the gas company's standards.

2. Three corrosion holes were found in the bare steel gas main after the accident; one hole measured over 1 inch in diameter.

3. Before the uprating, while the gas main was operating at 4 ounces of pressure, there was probably no leakage or minimal leakage from these corrosion holes because of the well-compacted dirt around the pipe.

4. After the gas pressure was increased to 17 psig, the well compacted dirt around the pipe at the corrosion holes was insufficient to contain the gas within the pipe.

5. Gas company personnel should have increased the pressure in the gas main from 4 ounces to 17 psig in at least two stages: from 4 ounces to 8 psig and from 8 psig to 17 psig, as required by 49 CFR 192.557.

6. Between stages of uprating, at 8 psig and again at 17 psig, gas company personnel should have surveyed the gas main for leakage, using a combustible gas indicator and checked the sewer manholes, as required by 49 CFR 192.553(a)(1), 49 CFR 192.723(b)(1), and the gas company's standards. This would have revealed the presence of the leak.

7. The gas company's operation and maintenance plan had no conversion procedures for uprating to higher pressure as required by CFR 192.605(d).

8. The gas company failed to establish a written procedure for the proposed uprating as required in 49 CFR 192.553(c).

9. The gas company did not adequately review the facilities to be uprated as required by 49 CFR 192.557(b)(1).

10. The leak detection survey, which preceded the uprating by 5 months, did not include a sewer manhole survey, as required by 49 CFR 192.557(b)(2) and 49 CFR 192.723(b)(1).

11. The occurrence of the accident at night when the commercial buildings in the downtown area were closed and unoccupied, prevented numerous fatalities and injuries.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the accident was the ignition of an accumulation of natural gas which had leaked from an existing corrosion hole in a 7-inch steel gas main when the pressure was increased suddenly from 4 ounces to 17 psig in one step. Contributing to the accident was the failure of gas company personnel to conduct an adequate leak survey, using combustible gas indicators (CGI), and to check adjacent sewer manholes during the period the gas pressure was increased. A possible source of ignition was a spark from an electric motor in a beverage cooler.

RECOMMENDATIONS

As result of its investigation of this accident, the National Transportation Safety Board made the following recommendations:

-- to the Delta Natural Gas Company, Inc.:

"Determine the condition of other cathodically unprotected pipe which may be comparable to the failed pipe, and develop a schedule for system improvement based on the findings. (Class II, Priority Action) (P-79-9)

"Develop written uprating procedures sufficient to comply with requirements of 49 CFR 192 Subpart K and related American Society of Mechanical Engineers guide material. (Class II, Priority Action) (P-79-10)

"As a part of the uprating procedures, provide the project foreman with a written plan that will account for the specific elements and variables of each case before the commencement of any uprating project. (Class II, Priority Action) (P-79-11)

"Train all personnel involved with uprating procedures to insure knowledge of applicable regulations and written company uprating procedures. (Class II, Priority Action) (P-79-12)"

-- to the American Gas Association:

"Advise its member companies of the circumstances of this accident and urge them to review their actual operating practices for uprating pipelines to insure that they conform to established company procedure, related industry guidelines, and Federal regulations. (Class I, Urgent Action) (P-79-13)"

-- to the Materials Transportation Bureau of the U.S. Department of Transportation:

"Monitor, through its State agent, the Kentucky Public Service Commission, the activity of the Gas Service Company, Inc., to uprate its gas distribution system in London, Kentucky, in compliance with the Federal regulations. (Class II, Priority Action) (P-79-26)"

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JAMES B. KING
Chairman

/s/ ELWOOD T. DRIVER
Vice Chairman

/s/ PATRICIA A. GOLDMAN
Member

/s/ G. H. PATRICK BURSLEY
Member

FRANCIS H. McADAMS, Member, did not participate.

August 16, 1979

APPENDIX A

GAS SERVICE COMPANY
PLAN OF OPERATION, INSPECTION AND MAINTENANCE

Pages IV.A.2
IV.A.3

IV. LEAKAGE CONTROL PROGRAM - Cont'd

A. 3. cont'd

* * * *

a. A Manhole and Street Opening Survey shall be conducted in the major business section and other congested commercial areas, around churches, schools, public gathering places and other areas at the discretion of the utility management based on knowledge of facilities and conditions under which they are operating. In general, this will be a gas detector type of survey of the atmospheres of available openings in the above areas. Survey results shall be recorded on a form similar to the one provided.

The presence of a combustible mixture in an opening shall be investigated.

b. A Building Survey shall be conducted of buildings in the major business area and other congested areas, churches, schools, multiple-dwelling apartments and public gathering places which receive gas service. Survey of a building shall include the service line, cracks and crevices at the building, inside basement and below ground level walls, meter set, and any house piping installed by the utility that is exposed and accessible to inspection.

* * * *

APPENDIX B

GAS SERVICE COMPANY
PLAN OF OPERATION, INSPECTION AND MAINTENANCE

MANHOLE AND STREET OPENING LEAKAGE SURVEY REPORT FORM

Area involved _____

_____

Survey by _____ Date _____

Checked by _____ Date _____

Use the following symbols for Type of Opening:

D - Storm Sewer Drain	Sa - Sanitary Sewer Manhole
E - Electric Manhole	St - Storm Sewer Manhole
Mg - Meter, gas	W - Water Manhole
Mw - Meter, water	Wg - Valve box, g
R - Regulator Pit	Vw - Valve box, w
C - Catch Basin	T - Telephone Manhole

Indicate Results by a Check in the Appropriate Column:

Type of Opening	Opening Number	Street Address or Intersection	Results Pos.	Results Neg.	Date Cleared	Remarks

Dates: _____ to _____ Sheet _____ of _____

APPENDIX C

EXCERPTS FROM
DELTA NATURAL GAS COMPANY, INC. STANDARD PRACTICES

STANDARD PRACTICE NO. O-28

DATE EFFECTIVE 6/8/71

REVISION DATE 5/15/75

GENERAL:

DISTRIBUTION

* * * *

B. Business districts shall be patrolled annually with a gas detector with particular emphasis on manhole, cracks in the pavement or wherever gas might possible be. (Business districts are defined as "any place within the city, town or village where two or more businesses are engaged in the purchase or sale of commodities or in related financial transactions.")

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