NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

PIPELINE ACCIDENT REPORT

CONSOLIDATED EDISION COMPANY
EXPLOSION AT
305 EAST 45TH STREET
NEW YORK, NEW YORK

APRIL 22, 1974

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16. Abstract

At 6:57 a.m. on April 22, 1974, a massive, low-order explosion demolished the west wall of a 25-story commercial building at 305 East 45th Street in New York City, New York. The structure of the adjacent building was damaged and glass was broken in other buildings in the area. Glass fragments and slivers were blown onto 46th Street, where they lay 1 inch thick in places. No persons were killed, but more than 70 persons were injured.

The National Transportation Safety Board determines that the probable cause of the accident was the rupture of an overpressured hydropneumatic tank which rocketed upward and tore an overhead gas service line out of its threaded joint; this allowed gas to flow unabated into the building. Contributing to the spread of the explosive gas-air mixture were the elevators, which drew the explosive mixture up through the elevator shafts before ignition.

As a result of its investigation of the explosion, the Safety Board made recommendations to the Department of Transportation, the Department of Housing and Urban Development, the Building Officials and Code Administration International, Inc., the Southern Building Code Congress, and the International Association of Plumbers and Mechanics Officials.

17. Key Words	18. Distribution Statement
Hydropneumatic pressure tanks; natural gas; excess flow valves; threaded connections; elevators; gas service line location; gas detection instruments; gas-air explosive mixture; glass fragments; fire departments; structural damage; pipeline accident; natural gas explosion.	This report is available to the public through the National Technical Information Service, Springfield, Virginia 22151

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FOREWORD

This report is based on an investigation and a public hearing by the National Transportation Safety Board under the authority of the Independent Safety Board Act of 1974.

The Office of Pipeline Safety of the Department of Transportation, the Occupational Safety and Health Administration of the Department of Labor, the New York State Public Service Commission, the New York City Fire Department, the New York City Department of Buildings, and the Consolidated Edison Company of New York, Inc., cooperated in the investigation.

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PIPELINE ACCIDENT REPORT

Adopted: February 19, 1976

CONSOLIDATED EDISON COMPANY
EXPLOSION AT 305 EAST 45TH STREET
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SYNOPSIS

At 6:57 a.m. on April 22, 1974, a massive, low-order explosion demolished the west wall of a 25-story commercial building at 305 East 45th Street in New York City, New York. The structure of the adjacent building was damaged and glass was broken in other buildings in the area. Glass fragments and slivers were blown onto 46th Street, where they lay 1 inch thick in places. No persons were killed, but more than 70 persons were injured.

The National Transportation Safety Board determines that the probable cause of the accident was the rupture of an overpressured hydropneumatic tank which rocketed upward and tore an overhead gas service line out of its threaded joint; this allowed gas to flow unabated into the building. Contributing to the spread of the explosive gas-air mixture through the building were the elevators, which drew the explosive mixture up through the elevator shafts before ignition.

FACTS

The Accident

At 6:15 a.m. on April 22, 1974, an employee of a photoprocessing company on the sixth floor of a 25-story commercial building at 305 East 45th Street in New York City, New York, entered the basement of the building and started a pump to pressurize the water system to the sixth floor. The water pressure was needed for the operation of the photographic process. The employee remained in the basement until he was sure that the pump had started. He then took the elevator from the basement to the sixth floor. Upon arrival, he checked the processing equipment and found that the water inlet pressure was only 10 psig, which was too low for the processing equipment's operation. When he returned to the elevator to go back and check the pump, he detected a gas odor. As he rode the elevator down, the gas odor was heavy and made his eyes tear. He got off on the first floor and spoke to the night watchman about the gas odor; the watchman had not noticed it. The employee then walked into the basement to check the pumps.

He noticed that the floor was covered with water, that one or more water pressure tanks had been knocked over, and that the smell of gas was heavy. He walked back to the first floor, explained the situation to the night watchman, and asked him for the telephone number of the New York City Department of Water Resources, Environmental Protection Administration. The employee returned by elevator to the sixth floor and called the water department to notify them of the problem. The building exploded at 6:57 a.m., while he was telephoning.

The accumulated natural gas began to ignite in the basement and rapidly propagated up the elevator shafts to the second story from the top. The explosion blew out the west wall and the windows on all four sides of the building. It also smashed the windows, blasted in the walls, scattered debris on all floors, and caved in the roof of a restaurant in the adjacent apartment building. Windows in other buildings were smashed and broken glass showered into the street.

Although there were no fatalities, about 70 persons were injured by the blast, the flying debris, and the broken glass. Most of the persons injured in the explosion were in the apartment house. (See Figures 1 and 2.)

Postaccident Activities

After the explosion, the employee on the sixth floor tried to escape from the building by the stairways, but they were impassible because of fallen debris and did not appear to be safe. The electric lights were on, but the elevators did not work because the shafts also were filled with fallen debris.

In the adjacent apartment house, panic-stricken residents, many badly cut by flying glass, rushed into the halls and attempted to vacate the building by the elevators, which were still operable, and by the stairs.

Police and fire department personnel from various locations arrived at the site and began rescue operations by 7:04 a.m. Ladder companies rescued those persons trapped on the upper floors of the affected building and other police and fire units entered the adjacent buildings to aid and evacuate the injured. The injured were taken to hospitals in ambulances and in police and fire department vehicles. Within 2 hours, all the injured had received initial treatment and all persons had been evacuated.

A small, gas-fed fire was burning from cracks in the basement floor of the affected building. Firemen did not extinguish the flame since it was under control and was consuming all the escaping gas.

The Consolidated Edison Company of New York, Inc., (Con Ed) personnel began arriving at 7:10 a.m. The dispatchers sent emergency personnel to the area after they heard and felt the blast, but before they received

Figure 1. Accident site at 305 East 45th Street, New York City.

Figure 2. Building entrance after explosion.

their first notification by telephone at 7:10 a.m. Fifteen minutes after the Con Ed personnel arrived, they had closed the curb valve to the affected building and to the adjacent apartment building. The small, gas-fed fire was extinguished shortly thereafter. Holes were drilled above the 8-inch gas main, the 6-inch service lines to both buildings, and other gas mains in the area. Con Ed tested these holes for gas, but found none. Con Ed then checked the neighboring buildings for natural gas, but found none.

After all persons were evacuated, all buildings were checked, and the small fire was extinguished, the fire department began initial inspections and cleanup activities so that the building could be entered safely by investigators. At 11 p.m., the inspection teams entered the basement of the affected building. The investigation revealed that the 6-inch service line had been torn out of its threaded coupling; it had been engaged by only two or three threads. (See Figure 3.) The investigators found five pressure vessels on their sides beneath the 6-inch service line; one of these tanks had a large dent in its top which conformed to the shape of the 6-inch pipe above it. (See Figure 4.) The bottom of the tank had blown out and several other tanks had bulges in their bottoms.

On April 24, Con Ed excavated the service lines to the affected building and to the adjacent apartment building and pressure-tested both service lines successfully to a pressure of 8 inches of water column. Con Ed subsequently replaced the service line to the apartment building because of corrosion.

Accident Site

Con Ed is the gas distribution utility serving Manhattan. An intermediate-pressure gas main (about 12-psig pressure) that circles Manhattan supplies gas to the various regulator stations in the accident area. The regulator stations reduce this 12-psig pressure to about 7 inches of water column and feed it into the low-pressure mains and services. Two regulator stations, at 32nd Street and at 62nd Street, supplied gas to the accident area. Both of these stations had recording pressure gauges in operation at the time of the accident, but neither recording chart showed any significant pressure variation during the accident period.

At the accident site, there was an 8-inch, cast iron, low-pressure gas main 36 inches under 46th Street and about 25 feet north of the affected building. A 6-inch, steel, thread-and-collar service line brought the gas from the main into the building. (See Figures 5 and 6.) Inside the building the line extended to a valve close to the basement wall. Con Ed claimed jurisdiction over and responsibility for this service line, up to and including that valve. (See Figure 4.) Additional 6-inch thread-and-collar piping extended south from this valve into the basement and was suspended

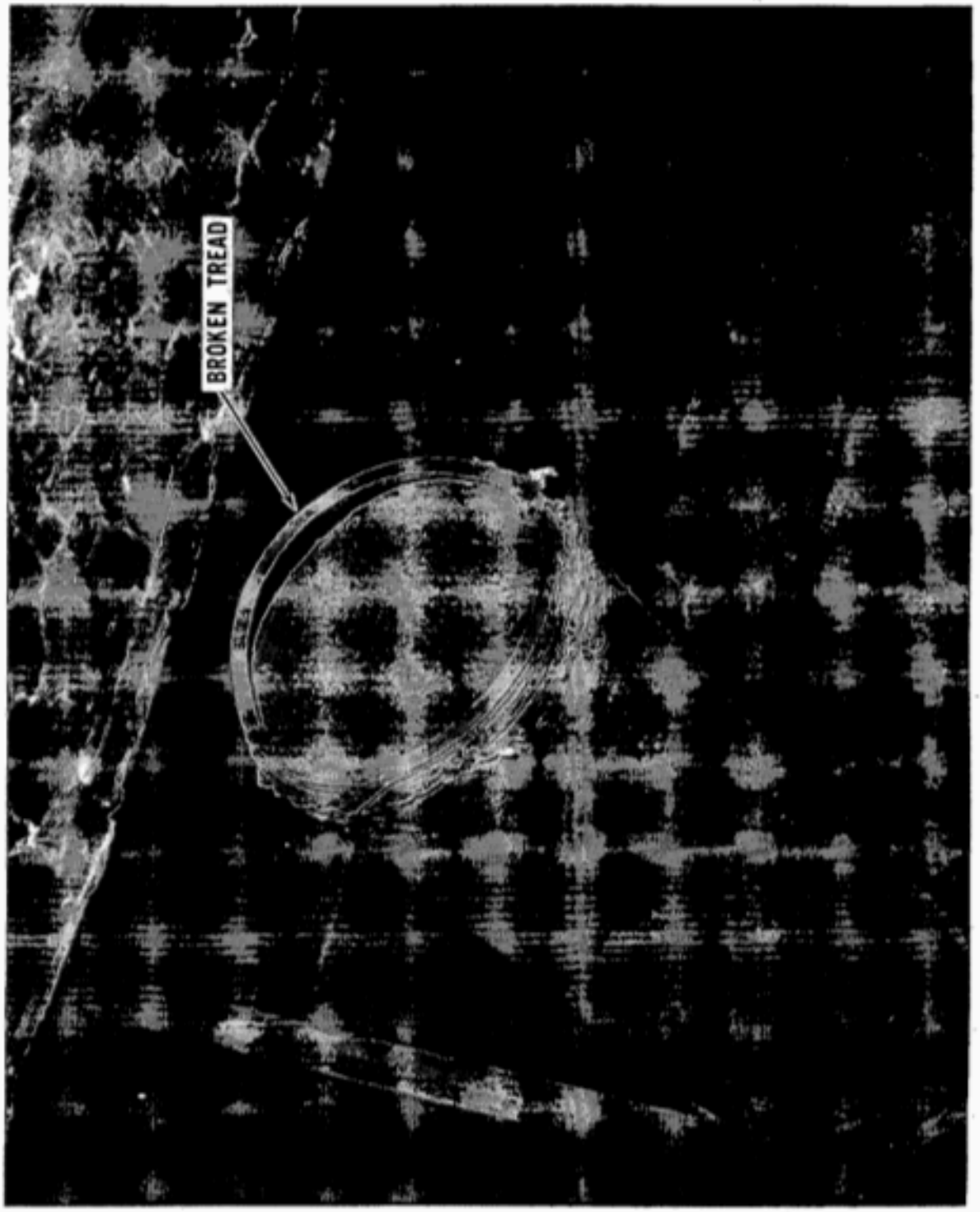

Figure 3. Broken threads on gas line in basement.

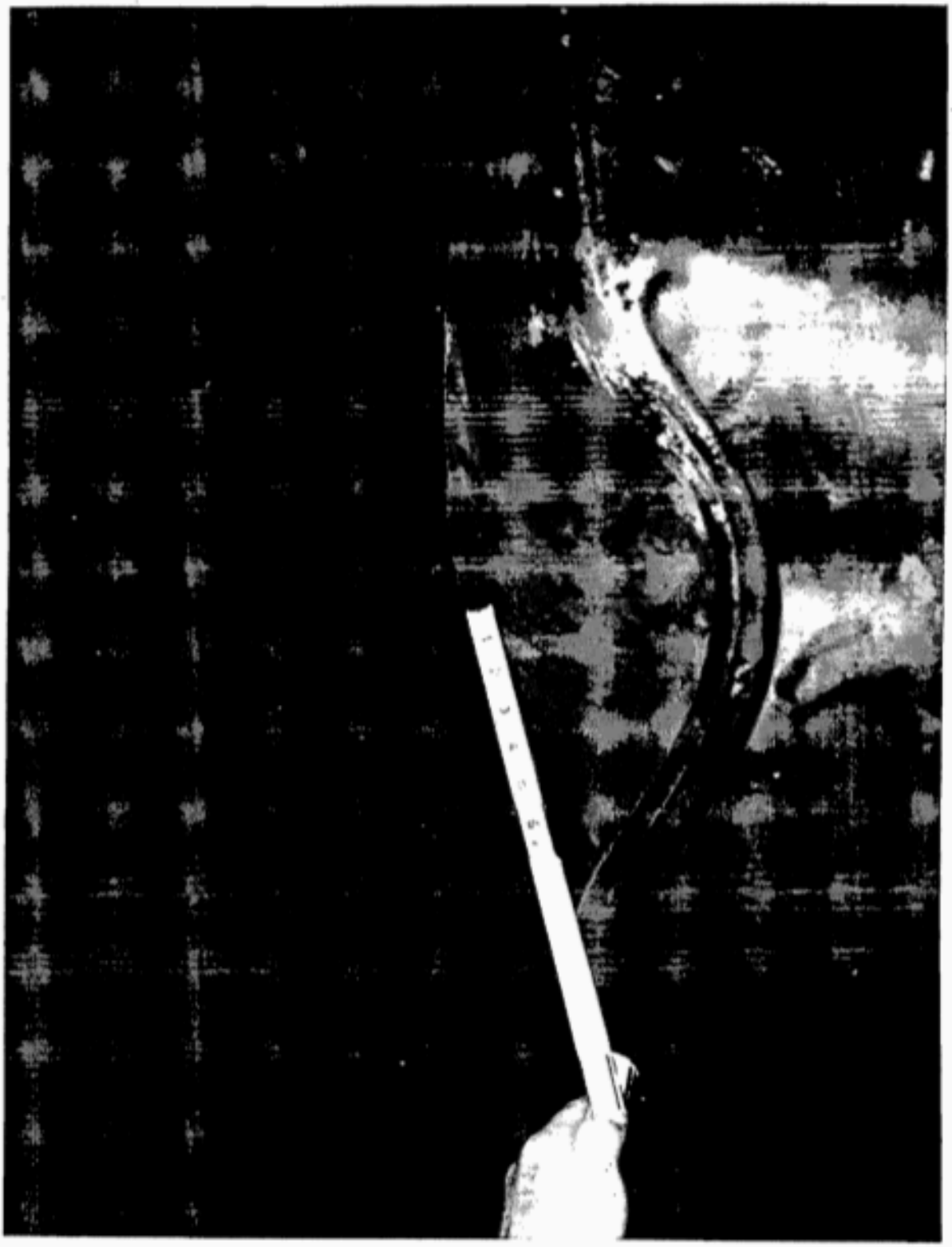

Figure 4. Dented hydropneumatic tank.

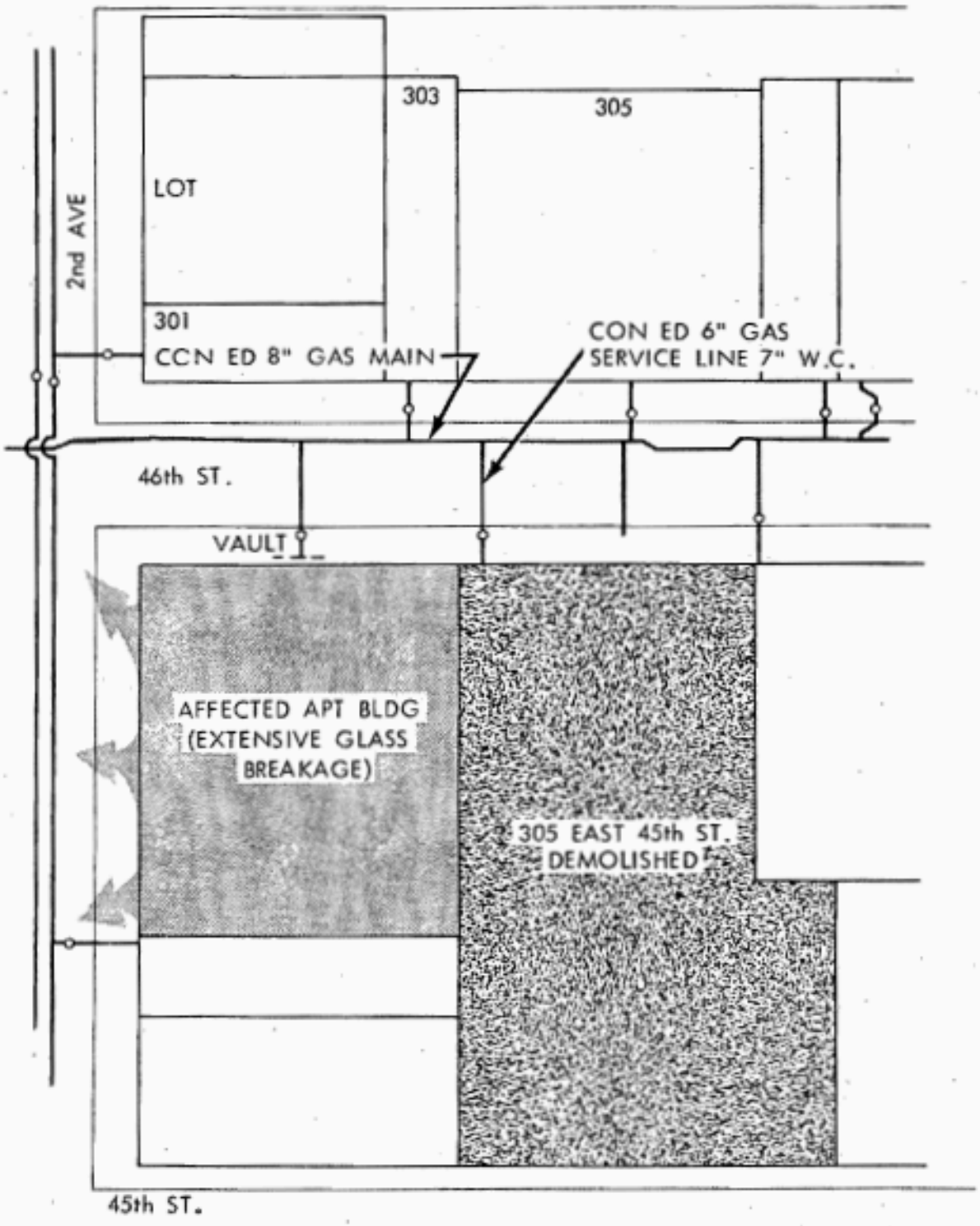

Figure 5. Service line connection from main to building.

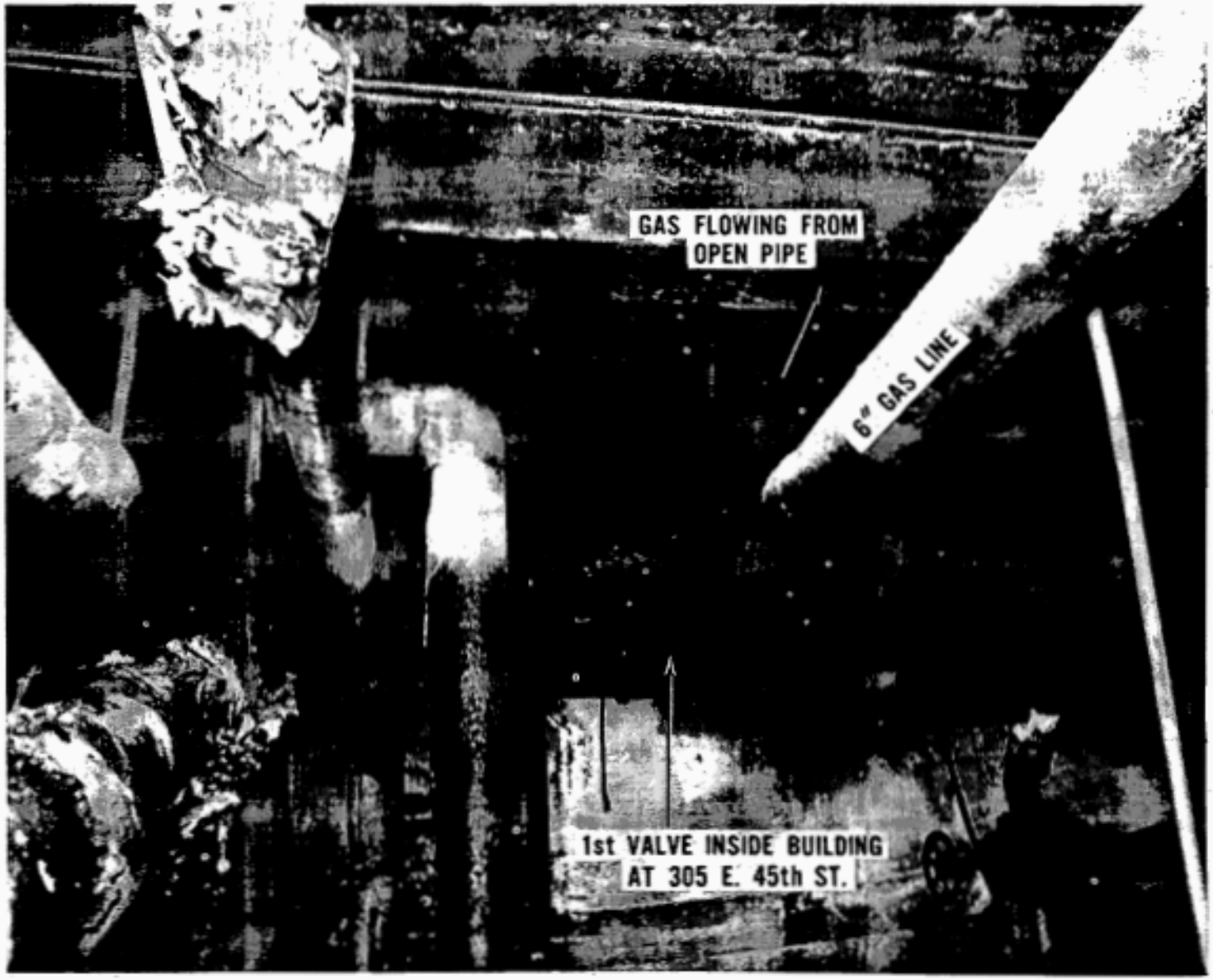

Figure 6. Gas piping configuration in basement of 305 East 45th Street.

from the ceiling by pipe hangers. In the middle of the basement, the service line turned upward and was connected to seven meters owned by Con Ed on the floors above; the last of these meters was located on the 19th floor. The piping between Con Ed's valve in the basement and the meters was owned and maintained by the owners of the building. Records were not available to show who installed this piping inside the building.

A public building inspection was conducted in the affected building on February 6, 1973, and a leaking 6-inch curb valve was discovered and repaired. Flame ionization surveys were conducted on January 7 and 8, 1974, and on March 11 and 13, 1974; no leakage of any magnitude was found.

Hydropneumatic System

The photoprocessing company on the sixth floor of the building needed 50 to 60 psig of water pressure for the proper operation of its processing equipment, but the water pressure normally available on the sixth floor was about 10 psig. Consequently, the company hired a firm to increase this low pressure. The firm installed two centrifugal pumps and one 120-gallon tank in 1970. The cylindrical tank was 60 inches high and 24 inches in diameter. It had a concave bottom, a convex top, and fittings on its side for a water fill line, a drain line, and an air bleed valve; no pressure relief valve was installed. The tank was filled partially with water and was designed to operate at a maximum pressure of 75 psig. A metal plate on the tank carried the maximum pressure notation. The system required that one of the pumps be operating all the time that photoprocessing was done.

Despite the installation of the pumps and tank, the water pressure still was inadequate, so in September 1973, the company requested the firm to rectify the problem. At this time, four tanks were added and pressure switches, set between 100 and 110 psig, were installed downstream of the pumps. These pressure switches were designed to shut the pumps down if the pressure rose above 110 psig. The five hydropneumatic pressure tanks and the two pumps were installed in the basement of the building and were located directly beneath the 6-inch natural gas service line.

The pressure was still unsatisfactory. It fluctuated between 60 psig and 40 psig rather than remaining steady. As a result of many letters and telephone calls complaining about this problem, the firm on April 20, 1974, installed a pressure-regulating valve to maintain a constant pressure on the discharge side of the pumps. It is not known whether the system was pressure-tested or test-operated after the modifications were made that day. After the explosion, the pump was examined and found to have an impellor capable of producing 125 psig against a closed valve. (See Figure 7.)

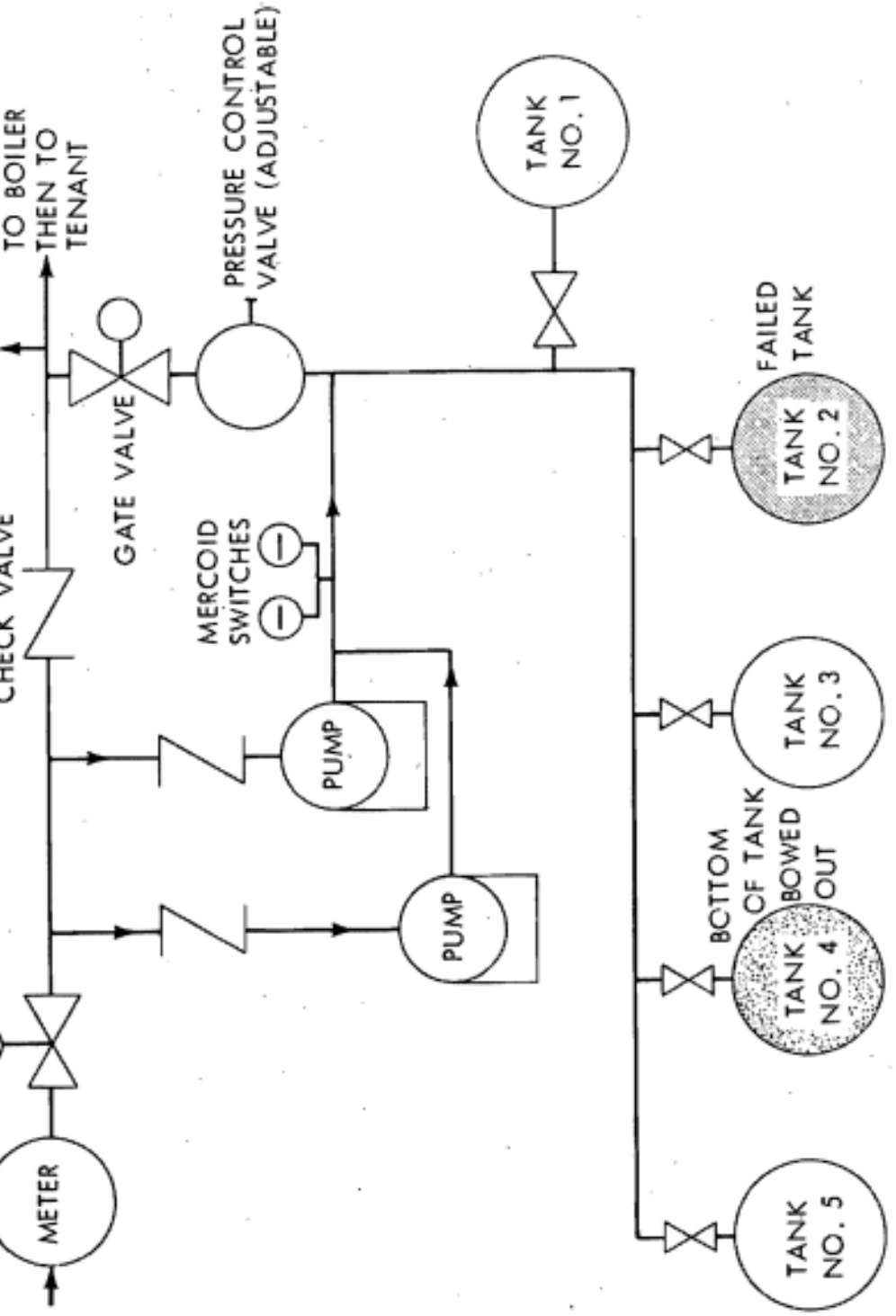

Figure 7. Schematic plan showing arrangements of hydropneumatic tanks and controls in the basement at 305 East 45th Street.

Gas Line Jurisdiction Inside Commercial Buildings

The 6-inch gas line in the basement of the building was considered by the Office of Pipeline Safety (OPS) to be a gas distribution main under the Federal safety regulation. 1/ The New York State Public Service Commission (PSC) is certified by DOT to take over the safety regulation of intrastate pipeline facilities within the State of New York. However, under the PSC's regulations, 2/ its jurisdiction ends at the first fitting inside the wall of the customer's structure. There are thousands of feet of gas service lines which extend from basement walls up through the building to the farthest gas meter and which are not under PSC's jurisdiction. Hundreds of feet of these lines are in walls, floors, ceilings, and other areas which are impossible to inspect. As a result, it is impossible to supervise their operation and maintenance. In New York City, the Department of Buildings has gas piping under its jurisdiction. It checks the piping design and inspects the installed piping in new buildings. Once approved, the buildings' owners have responsibility for the piping.

Threaded Pipe

A 6-inch standard pipe is threaded in accordance with the American National Standards Institute's code B-2.1. According to this code, 6-inch pipe requires eight threads per inch. A hand-tight fit, made when the pipe is screwed into the collar, requires 7 1/2 turns. Further tightening requires at least two more turns for a total engagement of about 9 1/2 threads. When this mechanical joint is pulled in a transverse direction, it will not fail before the pipe fails if the joint has been threaded and engaged properly.

In 1928, when the building in the explosion was constructed, the Briggs Pipe Thread Standard was the American standard for threaded pipe. The Briggs Standard also required 7 1/2 turns and an engagement of 9 1/2 threads.

Excess Gas Flow Valves

Excess gas flow valves, which can be installed in a service line and which close automatically when an excessive amount of gas starts to move through the service line, are manufactured currently. The valve remains open during normal gas flow, but if the line is severed and a large volume of gas begins to flow toward the rupture, the excess flow valve automatically closes and cuts off the gas. Most valves of this type range from 1/2 inch to 6 inches and are for use in high-pressure gas systems of 3 psig or more. Some manufacturers now claim to have similar valves on the market capable of operating at low pressures, such as the pressure in the affected building. However, when that building's service line was installed, no valves of this type were available commercially.

1/ 49 CFR 192.3
2/ 16 NYCRR 255.1855

The National Transportation Safety Board pointed out the problem of excess flow in its special study, "Effects of Delay In Shutting Down Failed Pipeline Systems and Methods of Providing Rapid Shutdown". 3/ The Safety Board also discussed this problem in its accident report on the rupture of a service line in Lake City, Minnesota, on October 30, 1972. 4/ In the Lake City report, the Board noted that the use of an excess flow valve at the junction of the main and the service line might have shut off the flow of gas after the line had been broken by a bulldozer and the resulting explosion with ensuing loss of life might have been averted. In both the special study and the accident report, the Safety Board recommended that OPS conduct a study to develop standards for rapid shutdown of failed pipelines and to study fail-safe devices to stop the flow of gas from ruptured lines. As a result of these recommendations, OPS contracted for a study on the "Rapid Shutdown of Failed Pipeline Systems and Limiting of Pressure to Prevent Pipeline Failure Due to Overpressure." The study concluded that excess flow valves would improve safety, that they are available and technically feasible, and that they are economically feasible. The Office of Pipeline Safety Operations currently is reviewing the study to determine what regulatory action it intends to take.

ANALYSIS

Failure of the Pressure Tanks

The hydropneumatic system in the basement of the building had been installed on a piecemeal basis without benefit of city inspections. From the start, the system had been operated at pressures higher than the tanks had been designed for, but the system was still unsatisfactory because of the pressure fluctuations on the sixth floor. The installation 2 days before the accident of the pressure-regulating valve was supposed to overcome the pressure fluctuation. When the pump was turned on, but the valves on the sixth floor were closed against it, the five tanks would experience 125-psig pump pressure plus 35-psig to 50-psig city water inlet pressure, for a possible 175-psig total pressure. The tanks were designed for a maximum pressure of 75 psig.

Normally, if a tank were completely full of water and failed at 175-psig pressure, the shell or bottom would split, a spurt of water would spray out, and the pressure would drop to 0 psig almost instantly. This is because at 175 psig, water is virtually incompressible; therefore, the stored or compressed energy is low and when the rupture occurs, the energy release is almost instantaneous. However, if a tank contained air, which is very compressible, then the energy release upon rupture would be violent. These five tanks contained air.

3/ National Transportation Safety Board, "Effects of Delay In Shutting Down Failed Pipeline Systems and Methods of Providing Rapid Shutdown." NTSB-PSS-71-1.

4/ National Transportation Safety Board, "Pipeline Accident Report -- Lake City, Minnesota, October 30, 1972." NTSB-PAR-73-1.

Tank No. 2, overpressurized when the pump was turned on the day of the accident, finally failed when its bottom blew out. After the bottom blew out, the tank rocketed upward, tore free from the piping connected to its side, and struck the 6-inch gas service line above it. The impact made a form-fitting dent in the top of the tank and tore the service line out of its threaded connection, allowing natural gas to escape from the 6-inch-diameter opening.

The failed tank was not a case of one weak tank in an otherwise adequate system; all four of the remaining tanks showed evidence of overpressure by the bulges in their bottoms. This system, as installed and as operated, would not have passed inspection by the New York City Department of Buildings.

Service Line Failure

The service line parted because of a sudden, sharp impact from the bursting tank. The impact was at a right angle to the threaded pipe connection, causing a shear failure; the threads on the bottom of the pipe were subjected to compression while those at the top of the pipe were subjected to tension. A properly connected pipe joint requires 9 1/2 threads to be engaged, but this threaded connection appeared to have no more than 3 threads engaged. Consequently, it would appear that the failed pipe joint was only one-third as strong as a properly connected pipe joint. It is possible that a joint with 9 1/2 threads engaged would not have failed under the impact of the bursting tank. The connection might have sustained some thread damage, but the resultant gas leakage would have been minor and possibly would have been detected before an accident resulted.

Uncontrolled Gas Flow After Failure

The service line, which now had parted completely and had its open end tilted toward the basement ceiling, emitted gas under a pressure of 7 inches of water column into the basement at a high volume. At 7 inches of water column, 54,000 cubic feet per hour would be emitted. About 27,000 cubic feet had accumulated and mixed with the air before the blast. The elevator travel mixed the gas with air and drew the now-explosive mixture from the bottom to the top of the elevator shaft. When the explosion occurred, it propagated rapidly to the top of the elevator shaft and blew out bricks and windows all the way up the building. In addition to the line failure, the uncontrolled, undetected gas flow afterward compounded the situation. Excess flow valves, which remain open during normal gas flow but shut when the flow becomes excessive, are now in use throughout the country. These valves are usually in the 3-psig range and above, but there are some valves which manufacturers claim will operate at a pressure of 7 inches of water column. The practicality of these excess flow valves has been argued, but the theory is sound, research is continuing, and work in this area should be expedited.

Gas Detection and Alarm Systems

This building, like many other commercial buildings, had no gas vapor detection or alarm systems. However, many varieties of gas detection and gas alarm instruments are available and some of these are in use in commercial buildings. There are no Federal or State regulations requiring these systems and a controversy exists concerning their effectiveness. The more reliable, higher quality equipment is expensive, but work is being done to produce a dependable, moderately priced instrument. One system employs a centrally located detection unit with numerous detection heads which can be located in various parts of a building where gas might accumulate. After the Safety Board investigated an accident in Bowie, Maryland, in 1973, gas detection devices were installed in 13 selected houses in the affected area by order of The Maryland State Public Service Commission. This was done because of concern regarding the possibility of continued leakage of odorless gas into the dwellings. The Washington Gas Light Company installed and maintained these devices and monitored them for correct calibration and sensitivity periodically. These devices require frequent adjustment by technicians.

Many commercial buildings are required to have smoke or heat detection instruments located at strategic positions in their interior. These instruments are designed to activate sprinkler systems if triggered by the smoke or heat of a fire. It appears logical that similar regulations could be adopted for the installation of gas detection instruments in these buildings.

Gas Lines Inside Buildings

When the New York PSC adopted the Federal regulations as required under the certification agreement with DOT, it adopted only those areas of the Federal Regulations over which the State had legal authority. The regulation of piping inside buildings was one area over which the State did not have authority. In general, operators of intrastate pipeline facilities are required to comply with State regulations when the State is certified by DOT. However, when a State does not adopt a certain portion of the Federal regulation, the pipeline operators must comply directly with those portions of the regulations. In this case, the operator, Con Ed, contends that its jurisdiction ends at the first fitting inside the building wall, while OPS contends that all the piping in the building, up to the meters, is subject to every section of 49 CFR 192, including corrosion control and operation and maintenance requirements. While the Federal regulation mandates responsibility for this piping to pipeline operators, no enforcement of these regulations has taken place. A more realistic approach would be for the owner of a building to be responsible for the piping. Most cities have jurisdiction over gas piping in buildings, and they are in a more realistic position than Federal or State agencies to enforce standards concerning this piping.

Standards for Piping Location

The location of the hydropneumatic pressure tanks directly under the gas service line was a critical factor in this accident. The tanks should have been located at some other point in the basement where potential danger to existing facilities would be at a minimum. Currently, there is no Federal agency with authority to deal with this problem of piping location within buildings. Plumbing codes, which include gas piping, are set up on a State, county, and city basis, but there is no Federal code. There are three basic plumbing codes from which, in whole or in part, the States, counties, and cities have derived their own codes. The trade groups that developed these codes are the International Association of Plumbers and Mechanics Officials, the Southern Building Code Congress, and the Building Officials and Code Administration International, Inc. Some uniformly accepted guidance in this area of plumbing location is needed.

CONCLUSIONS

1. The source of the ignition was unknown, but the origin of the accumulated natural gas was a separated 6-inch gas service line in the basement.

2. The service line was torn from its threaded joint when a pressure tank below the line burst and hit it.

3. The service line was connected inadequately by only two or three threads instead of the nine required by code.

4. The location of the pressure tanks directly beneath the service line created an avoidable hazard; however, no Federal, State, or city regulations existed concerning the installation of pressure tanks or other hazardous materials near gas service lines.

5. When the service line was installed, no excess flow equipment was available and practical to shut off any sudden, rapid flow of gas from a separated pipe. Research is underway to solve this problem.

6. No instruments to detect and warn of leaking gas had been installed in this building although such equipment is available. No regulations exist which require this installation although regulations do exist requiring instrumentation to detect and warn of smoke and fire.

7. The Federal regulation requiring pipeline operators to be responsible for the operation and maintenance of gas piping inside buildings over which they have no control is unrealistic and impractical.

PROBABLE CAUSE

The National Transportation Safety Board determines that the probable cause of the accident was the rupture of an overpressured hydropneumatic tank which rocketed upward and tore an overhead gas service line out of its threaded joint; this allowed gas to flow unabated into the building. Contributing to the spread of the explosive gas-air mixture through the building were the elevators, which drew the explosive mixture up through the elevator shafts before ignition.

RECOMMENDATIONS

The National Transportation Safety Board made five recommendations based on the investigation of this accident. Two are addressed to the Department of Transportation, one is addressed to the Department of Housing and Urban Development, and one is addressed to the Building Officials and Code Administration International, Inc., the Southern Building Code Congress, and the International Association of Plumbers and Mechanics Officials.

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ WEBSTER B. TODD, Jr.
Chairman

/s/ FRANCIS H. McADAMS
Member

/s/ LOUIS M. THAYER
Member

/s/ ISABEL A. BURGESS
Member

/s/ WILLIAM R. HALEY
Member

February 19, 1976

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

APPENDIX A

ISSUED:

Forwarded to:

Honorable William T. Coleman, Jr.
Secretary
Department of Transportation
Washington, D. C. 20590

SAFETY RECOMMENDATION(S)

P-76-9 through P-76-11

At 6:57 a.m. on April 22, 1974, a massive, low-order explosion demolished the west wall of a 25-story commercial building at 305 East 45th Street in New York, New York. The structure of the adjacent building was damaged and glass was broken in other buildings in the area. Glass fragments and slivers were blown into 46th Street, where they lay 1 inch deep in places. No persons were killed, but more than 70 persons were injured.

The National Transportation Safety Board's investigation showed that a 6-inch service line located in the basement of the building had been struck from below and severed by a ruptured hydropneumatic pressure tank installed directly underneath. Gas at 7 inches of water column flowed at 54,000 cubic feet per hour from the open end of the separated service line. Gas leakage continued for about 1/2 hour. Gas odors finally were noticed by a building occupant, but the building exploded before any mitigative efforts took place.

Excess flow valves which can be installed in a service line and which will close automatically when an excessive amount of gas (a predetermined increased rate of flow) begins to move through the pipe are manufactured currently. This type of valve remains open under normal gas flow conditions, but if the line should be severed and a large volume of gas begins to flow through the rupture, the excess flow valve would close automatically. Most valves of this type are for use in high-pressure gas distribution systems of 3 psig or more, but research is being done on similar valves capable of operating at only a few inches of water column.

APPENDIX A

The 6-inch gas service line in the basement was considered by the Office of Pipeline Safety to be a gas distribution main and therefore under the Federal regulation 49 CFR 192.3. The New York State Public Service Commission's regulation, 16 NYCRR 255.1855, maintains that the pipeline operator's jurisdiction ends at the first fitting inside the wall of a customer's structure. This is based on the impracticability of a pipeline operator's trying to operate and maintain thousands of feet of gas piping inside the walls and ceilings of thousands of buildings within the state.

Therefore, the National Transportation Safety Board recommends that the Office of Pipeline Safety Operations of the Department of Transportation:

(1) Determine the availability, the practicability, and the state-of-the-art in the manufacture of excess flow valves for use on low-pressure gas distribution systems. Based upon the results of these findings, amend 49 CFR 192 to incorporate the use of these valves in commercial buildings. (Recommendation P-76-9)(Class II, Priority Followup)

(2) Amend 49 CFR 192 to define more realistically an operator's responsibility for gas piping inside buildings. (Recommendation P-76-10)(Class II, Priority Followup)

(3) Expedite its review of the study of "Rapid Shutdown of Failed Pipeline Systems and Limiting of Pressure to Prevent Pipeline Failure Due to Overpressure" and determine what regulatory action is necessary concerning the use of excess flow valves. (Recommendation P-76-11)(Class II, Priority Followup)

TODD, Chairman, McADAMS, THAYER, BURGESS, and HALEY, Members, concurred in the above recommendations.

By: Webster B. Todd, Jr.
Chairman

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

APPENDIX B

ISSUED:

Forwarded to:

Honorable Carla A. Hills
Secretary
Department of Housing and Urban
Development
Washington, D. C. 20410

SAFETY RECOMMENDATION(S)

P-76-12

At 6:57 a.m. on April 22, 1974, a massive, low-order explosion demolished the west wall of a 25-story commercial building at 305 East 45th Street in New York, New York. The structure of the adjacent building was damaged and glass was broken in other buildings in the area. Glass fragments and slivers were blown into 46th Street, where they lay 1 inch deep in places. No persons were killed, but more than 70 persons were injured.

The National Transportation Safety Board's investigation showed that a 6-inch gas service line located in the basement of the building had been struck from below and severed by a ruptured hydropneumatic pressure tank installed directly underneath. Gas at 7 inches of water column flowed at 54,000 cubic feet per hour from the open end of the separated service line. Gas leakage continued for about 1/2 hour. Gas odors were noticed by a building occupant, but no gas detection equipment had been installed and therefore no alarm was sounded. The occupant who smelled gas alerted the night watchman of the incident and initiated a telephone call to report the matter. The building exploded before the escaping gas could be shut off and before the sources of ignition could be eliminated.

Gas vapor detection equipment is available and in use for the detection of gas. The more reliable, higher quality equipment is expensive, but work is being done to produce a dependable, moderately priced instrument. One system employs a centrally located detection unit with numerous detection heads which can be located in various parts of a building where gas might accumulate.

APPENDIX B

Many commercial buildings are required to have smoke or heat detection instruments located at strategic positions in their interior. These instruments are designed to activate sprinkler systems if the instruments are triggered by the smoke or heat of a fire. It seems logical that similar requlations could be adopted for the installation of gas detection instruments in buildings.

Therefore, the National Transportation Safety Board recommends that the Department of Housing and Urban Development:

> Investigate the practicability and the availability of gas vapor detection instruments for installation at strategic locations in buildings. Based on the results of this investigation, recommend guidelines to appropriate State and local government agencies for regulations for the installation of gas detection instruments in buildings. (Recommendation P-76-12)(Class II, Priority Followup)

TODD, Chairman, McADAMS, THAYER, BURGESS, and HALEY, Members, concurred in the above recommendations.

By: Webster B. Todd, Jr.
Chairman

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

APPENDIX C

ISSUED:

Forwarded to:

Mr. Richard L. Sanderson
Executive Director
Building Officials and Code
Administration International, Inc.
1313 East 60th Street
Chicago, Illinois 60637

SAFETY RECOMMENDATION(S)

P-76-13

Mr. William Vasvary
Executive Director
Southern Building Code Congress
3617 Eighth Avenue South
Birmingham, Alabama 35222

Mr. Neil McLean
Executive Director
Plumbing Code Committee
International Association of Plumbers
and Mechanics Officials
5032 Alhambra Avenue
Los Angeles, California 90032

At 6:57 a.m. on April 22, 1974, a massive, low-order explosion demolished the west wall of a 25-story commercial building at 305 East 45th Street in New York, New York. The structure of the adjacent building was damaged and glass was broken in other buildings in the area. Glass fragments and slivers were blown into 46th Street, where they lay 1 inch deep in places. No persons were killed, but more than 70 persons were injured.

The National Transportation Safety Board's investigation showed that a 6-inch service line located in the basement of the building had been struck from below and severed by a ruptured hydropneumatic pressure tank installed directly underneath. Gas at 7 inches of water column flowed at 54,000 cubic feet per hour from the open end of the separated service line. Gas leakage continued for about 1/2 hour. Gas odors finally were noticed by a building occupant, but the building exploded before any mitigative efforts took place.

APPENDIX C

The location of the hydropneumatic pressure tanks directly under the gas service line was a critical factor in this accident. Since the gas line was installed first around 1930, and the pressure tanks were installed at a later date, the tanks should have been located at some other point in the basement where potential danger to existing facilities would be at a minimum. No Federal, New York State, or New York City regulations exist for the placement of equipment in relation to other equipment in basements. The plumbing codes also do not specifically relate to the placement of equipment in relation to other equipment, but these codes form the basis for the city regulations.

Therefore, the National Transportation Safety Board recommends that the Building Officials and Code Administration International, Inc., the Southern Building Code Congress, and the Plumbing Code Committee of the International Association of Plumbers and Mechanics Officials:

> Review their codes to insure that adequate instructions are listed for the location of natural gas service lines in relation to other plumbing facilities such as pressure tanks and boilers in industrial, commercial, and residential buildings. (Recommendation P-76-13)(Class II, Priority Followup)

TODD, Chairman, McADAMS, THAYER, BURGESS, and HALEY, Members, concurred in the above recommendations.

By: Webster B. Todd, Jr.
Chairman