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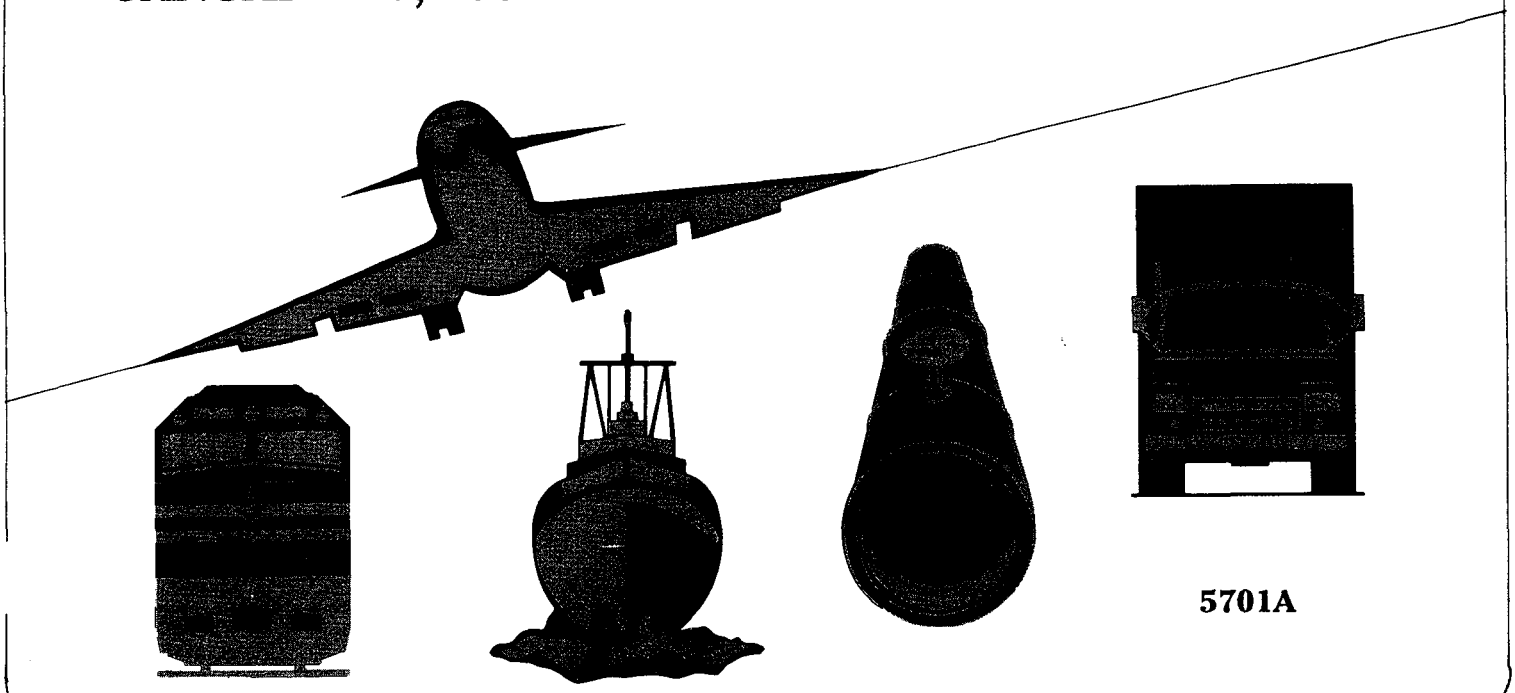
NTSB/PAR-93/01/SUM

NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

PIPELINE ACCIDENT/INCIDENT SUMMARY REPORT

OVER-PRESSURE OF PEOPLES GAS LIGHT AND COKE COMPANY LOW-PRESSURE DISTRIBUTION SYSTEM
CHICAGO, ILLINOIS
JANUARY 17, 1992



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Abstract: This publication contains one summary report of an accident investigated by the National Transportation Safety Board. The safety issues discussed in the report are the adequacy of Peoples' emergency training and procedures for its operating personnel, the adequacy of Peoples' regulator-inspection procedures, and the adequacy of Peoples' customer-education program.

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National
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Washington, D.C. 20594

PIPELINE ACCIDENT/INCIDENT SUMMARY

Accident Number:	DCA-92-FP-004
Location:	River West Area of Chicago, Illinois
Date and Time:	January 17, 1992, 3:45 p.m. (CST)
Company:	Peoples Gas Light and Coke Company
Accident Type:	Over-pressure, Explosion, and Fires
Injuries:	Four persons killed, 4 injured
Damage:	In excess of $1 million

While a crew from Peoples Gas, Light and Coke Company (Peoples) was doing routine annual maintenance work on a monitor regulator at one of its regulator stations,[1] high-pressure gas[2] entered a low-pressure system. The gas--under as much as 10 psig of pressure--escaped through gas appliances into homes and other buildings, where it was ignited by several unidentified sources. The resulting explosion and fires killed 4 people, injured 4, and damaged 14 houses and 3 commercial buildings. (See figure 1.)

The accident happened at 3:45 p.m. (central standard time) on January 17, 1992. The maintenance was being done at the Erie & Green regulator station, one of the two stations serving the River West area of Chicago, Illinois, an area bounded by the Kennedy Expressway, the Chicago River, and Kinzie and Cortez streets. As a result of its investigation of this accident, the National Transportation Safety Board identified three major safety issues:

- Adequacy of Peoples' emergency training and procedures for its operating personnel.

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[1]Peoples' regulator stations consist of a district regulator that reduces high-pressure gas to low pressure and a monitor regulator that takes over if the district regulator fails. Each regulator and its controls are in a separate underground street vault. The area in which the accident happened was supplied by two regulator stations--the Erie & Green station and the Chicago & Carpenter station. (Peoples' regulator stations are named for the nearby streets.)

[2]According to 49 *Code of Federal Regulations* (CFR) 192.3, gas is high pressure if it is under more pressure than the pressure provided to the customer. It is low pressure if it is under the same pressure that is provided to the customer.

The Peoples Gas - River West Area

Figure 1. -- Area of accident.

- Adequacy of Peoples' regulator-inspection procedures.
- Adequacy of Peoples' customer-education program.

This summary report will address these safety issues following a discussion of the accident and the emergency response.

I. ACCIDENT

On January 15, 2 days before the accident, the Peoples gas operations section (GOS) crew, which consisted of two vault mechanics, a junior vault inspector, and a supervisor, began a routine inspection of the 6-inch Reynolds gas regulators at the Erie & Green station. (See figure 2.) A routine inspection involves examining and/or overhauling the district and monitor regulators, operations that are often done on the same day unless more pressing system maintenance is required.[3] The crew overhauled the district regulator but did not have time to overhaul the monitor regulator.

On January 17, the junior vault inspector did not report to work. After lunch, the two vault mechanics and the supervisor inspected the monitor regulator. They used a procedure that was similar to the one they had used 2 days earlier to inspect the district regulator.

First, they installed manometers at valves D-10 and M-9. The manometers were capable of measuring up to 12 inches of water column (0.433 psig) and were filled with water. The valves below the manometers were opened to allow the gas pressure in the distribution system to register. The downstream pressure was found to be normal, about 1/4 psig (7.5 inches of water column).

Then the crew took the station out of service and provided gas to the system by manually opening and adjusting a bypass valve (D-3) on a 4-inch gas line around the station. To accomplish this, the supervisor adjusted the setting of the low-pressure auxiliary pilot regulator in the district vault, which caused the district regulator to begin closing, while the vault mechanic in the district vault opened[4] bypass valve D-3 until the downstream gas pressure became steady at 1/4 psig. The supervisor then adjusted the auxiliary pilot regulator in order to fully close the district regulator.

Next the vault mechanic closed the monitor outlet valve (M-2), left the inlet valve (M-1) open while he inspected the monitor regulator valve stem packing, and closed valve M-1 before he disassembled the monitor regulator for inspection. According to testimony, the supervisor read the manometer on three occasions, and the vault mechanic occasionally read his manometer while inspecting and overhauling the monitor regulator. No one was assigned the full-time task of reading the manometer in either the district or the monitor vault and of manually adjusting valve D-3 as necessary to maintain a safe downstream pressure.

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[3]Title 49 CFR 192.739 requires that regulators be inspected each calendar year at intervals that are not to exceed 15 months.

[4]Valve D-3 was normally closed, and valve M-3, the bypass valve in the monitor regulator, was normally open. When gas was supplied through the bypass line, either bypass valve could be used to stop the flow.

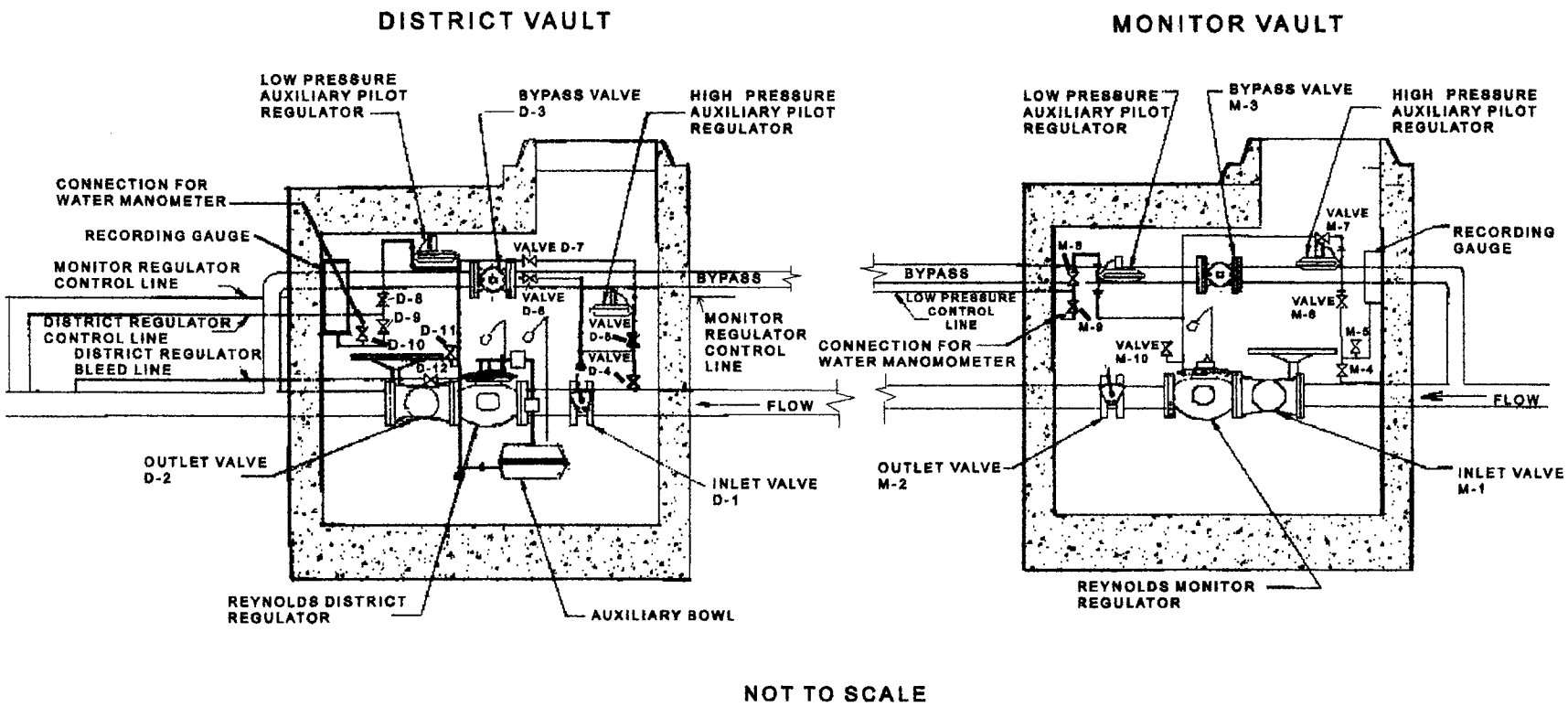

Figure 2. -- Erie & Green regulator station diagram.

About 3:45 p.m., when the vault mechanic had finished inspecting the monitor regulator, he adjusted its high- and low-pressure auxiliary pilot regulators, causing the monitor regulator to open, and they opened valves M-1 and M-2. The supervisor, who was in the district vault, they began to place the station back in service. Testimony from both the supervisor and the crewmembers indicate that the supervisor's actions were consistent with the procedures in Peoples' *Gas Operations Training Manual*: First, he opened the inlet and outlet valves (D-1 and D-2). He observed that the district regulator remained closed. Next, he turned valve D-3 toward the closed position to reduce the pressure from 7 1/2 inches to 7 inches of water column.

The supervisor testified that as he was turning valve D-3 toward the closed position, the water in the district-vault manometer blew out and that the vault mechanic in the monitor vault told him that the water in its manometer had also blown out. The vault mechanic heard the low-pressure auxiliary regulator emit a noise similar to escaping gas. Within several minutes, unknown to the crew, an explosion and several fires occurred; the first fire was reported to the fire department at 3:57 p.m.

During postaccident testimony, the supervisor stated that he knew that the blowing of water from the manometers indicated that high-pressure gas was entering the low-pressure system and that he knew the consequences of high-pressure gas entering a low-pressure system. He said he knew "there was a big problem" but that he did not close valve D-3 because he believed that he did not have the authority to do so and because he believed that the over-pressure was not caused by his or his crew's actions.

However, in postaccident testimony the supervisor's manager (the GOS superintendent) said that the supervisor did have the authority to close the bypass valve (see figure 3). Another supervisor with responsibilities comparable to the ones of the supervisor involved in the accident also testified. He said that if he were confronted with a similar situation, he would have the authority to take all necessary actions, including closing a valve.

According to testimony, the vault mechanic closed valves M-6, M-8, and M-9; then he replaced the low-pressure auxiliary regulator in the monitor vault, which he believed might have failed when the water had been blown out of the manometer. He refilled the manometer and then opened the valves he had closed. First, he opened valve M-8, and the low-pressure auxiliary regulator again sounded like gas was escaping. Next he opened valve M-9; and once again, water blew out of the manometer. He removed the manometer, installed a gauge, which registered 10-psig pressure, and then notified the supervisor.

When the vault mechanic told the supervisor that the water had blown out a second time, the supervisor called on the radio (about 4:06 p.m.) to alert Peoples' GOS management to the problem. Another GOS supervisor answered the call. The supervisor at the Erie & Green station said that water had blown out of the manometers and that "the fire department [is] over here for some reason." The other supervisor said that Peoples had received one report about a fire and several reports about abnormally large appliance pilot lights that had blown out. The GOS superintendent heard a portion of the call and radioed the supervisor at the Erie & Green station, who told him that the water in manometer had blown out twice while the station was on bypass.

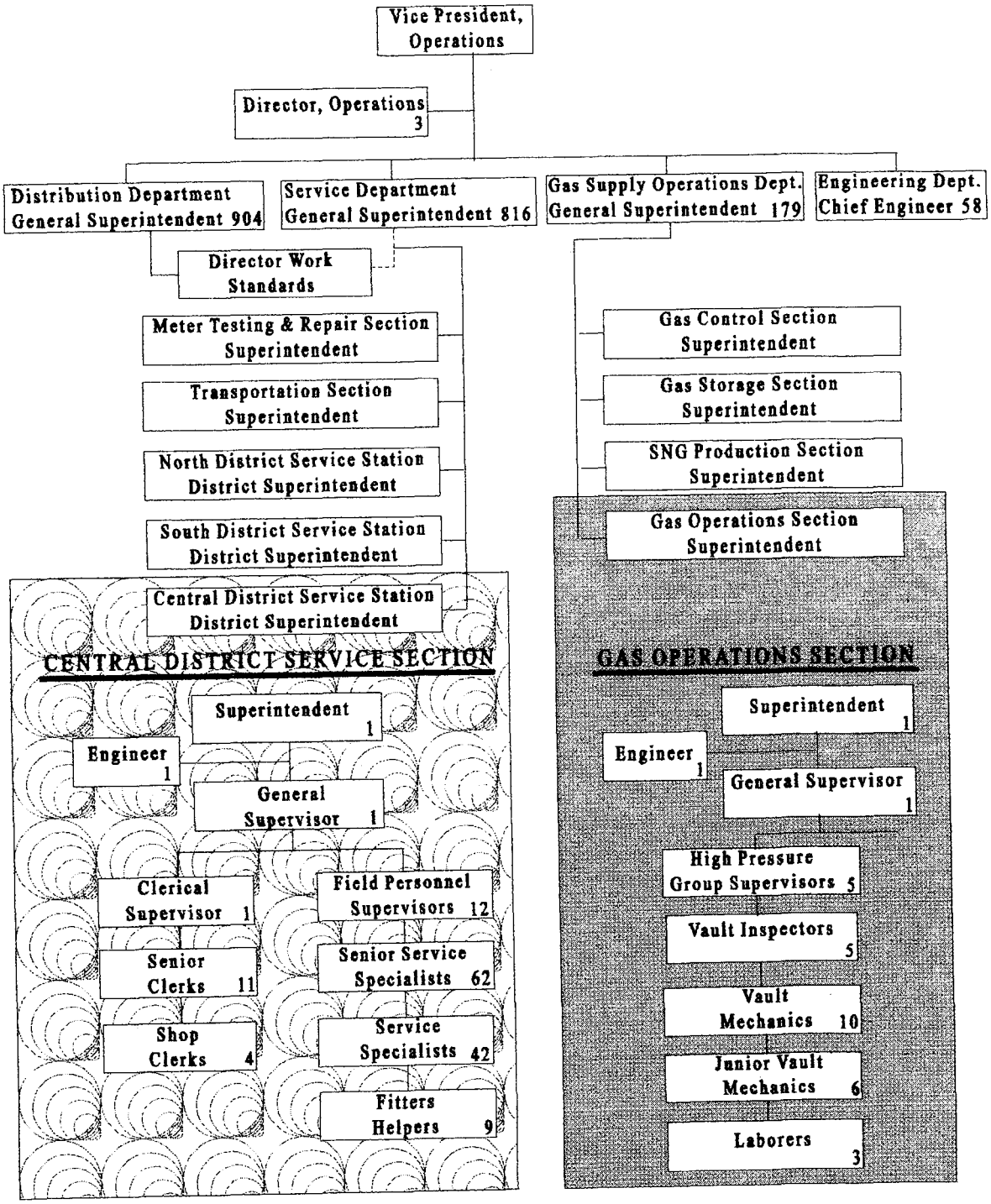

Figure 3. -- Selected parts of Peoples' gas operations organization chart.

In accordance with Peoples' emergency operating plan, GOS management tried to determine the cause of the incident. The superintendent sent a crew to the Chicago & Carpenter station to determine the source of the over-pressure. In postaccident testimony, the superintendent said he felt that the problem could not be coming from the Erie & Green station because the crew there collectively had more than 35 years of experience. The GOS general supervisor was alerted by telephone. Not knowing of the superintendent's earlier directions, the general supervisor also directed that a crew be dispatched to the Chicago & Carpenter station to find out whether it was the source of the problem. He later testified that he believed there was no need to send anyone to the Erie & Green station because the supervisor there was experienced. The general supervisor was not told that high-pressure gas was in the low-pressure system, and he did not question the supervisor fully about the situation at Erie & Green.

A two-person crew arrived at the Chicago & Carpenter station at 4:22 p.m. The crew found gas in the district-regulator vault, which had to be vented before anyone could safely enter it. At 4:26, a crewmember entered the vaults and checked the status of the regulators. Although later investigation disclosed that both regulators had closed when the downstream pressure reached a pressure higher than their operating set points, a crewmember incorrectly told the general supervisor that the monitor regulator was normal and that the district regulator was wide open. The general supervisor then commanded by radio that the district-regulator control arm be blocked closed so the station would be shut down.

Minutes after 4:30 p.m., the general supervisor heard a radio message that fires were occurring in buildings within the River West area. As soon as the Chicago & Carpenter station was shut down, he radioed the supervisor at the Erie & Green station and told him to close the bypass valve. A vault mechanic closed valve D-3 about 4:35, and the system pressure quickly went to zero. A general service supervisor who was measuring the gas pressure in a house a few blocks away verified the drop in pressure in his testimony .

II. EMERGENCY RESPONSE

The city of Chicago and Peoples' service-department personnel responded effectively to the emergency.

The Chicago fire department was alerted by numerous calls to 911. The department received the first call (from 937 North Racine Avenue) at 3:57 p.m., and the first unit reached the scene at 4:00 p.m. Before the emergency ended, a total of 200 firefighters from 18 fire companies had responded. Approximately 130 police officers in 79 vehicles helped with traffic and crowd control. The city implemented its basic emergency plan, which did not include specific provisions for responding to a natural gas emergency; however, provisions for a utility emergency are now being formulated. The fire department implemented its fire incident command system.[5] The fire incident commander effectively coordinated the activities of the 18 fire companies, the work of the city's department of human services, and the activities of other local agencies. He also coordinated the meter-turnoff activities with Peoples. The Safety Board concludes that Chicago's emergency response was well coordinated and executed.

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[5]The incident command system establishes procedures for controlling and coordinating personnel, facilities, equipment, and communications during all phases of an emergency.

Peoples' general service supervisor from the central district followed company procedures and immediately left for the fire station closest to the incident location, helping two customers on the way. In the building of one of the customers, he measured the gas pressure and initially obtained a reading of 5 psig; but while he was measuring the pressure, it dropped to zero. At the fire station, he learned that the fire department's command control center was at Milwaukee and Racine streets. Once there he notified the fire department of Peoples' activities and assigned a gas-company employee to coordinate activities with the fire department.

Peoples' service department also responded very well. Thirty of its service persons responded within an hour of the accident, 60 within 2 hours, and 111 within 3 hours. Many of them were from the north and south district shops and had to travel more than a dozen miles through rush hour traffic to reach the area of the emergency. Additionally, the general service supervisor was able to rapidly mobilize six service supervisors to oversee the shutdown of every accessible meter (about 630) in the area. Inaccessible meters were shut off either by turning off an outside service line or by cutting the service line outside and sealing it.

The excellent emergency response coordination between Peoples' service department and the fire department contributed to reducing the property damage.

III. POSTACCIDENT INVESTIGATION

The Safety Board examined the pressure control equipment and the auxiliary pilot regulator in both the Chicago & Carpenter and the Erie & Green stations and found that all of it was working properly. Therefore, the Safety Board concludes that the over-pressure was not caused by any regulator malfunction.

The Safety Board considered two ways that the system could have become over-pressured: (1) the supervisor mistakenly turned valve D-3 toward the open instead of the closed position when the station was being returned to service; (2) debris was partially blocking the orifice of valve D-3 and became dislodged when the station was being returned to service.

The supervisor testified that just before the system became over-pressured he was turning valve D-3 toward the closed position. The Safety Board was unable to develop other information to either confirm or deny his statement.

Valve D-3 did contain debris; however it was not likely to have significantly affected the flow of gas. Laboratory tests showed that it was a minor accumulation of heavy petroleum grease and petroleum-based products. Such an accumulation is not unusual, especially since the crew had lubricated the valve 2 days before the accident. Peoples used a video camera to search within the low-pressure gas mains near valve D-3 for other debris that might have come out of the valve, but none was found.

Safety Board investigators determined from the testimony of the supervisor and one of the vault mechanics the approximate degree to which valve D-3 was open when the monitor regulator was being inspected. Measuring the valve showed that it had been opened to about 50 degrees. (At 90 degrees the valve is fully open.) An independent laboratory determined the amount of gas that could flow through the valve at various degrees of opening, and Peoples used a computerized gas system model to estimate the flow needed to equal customer gas

use on the day of the accident. The estimated gas flow on the day of the accident could have been supplied without the system being over-pressured had the valve been opened to about 45 degrees. The degree of error involved in estimating the extent to which the valve was open when work was being performed on the monitor regulator and in estimating the amount of gas being used by customers at the time of the accident can not be determined.

Consequently, the Safety Board concludes that there is not enough evidence to decide which way the supervisor turned the valve and whether the valve was blocked by debris that became dislodged. However, regardless of the cause of the over-pressure, this accident could have been prevented or mitigated had the supervisor, who testified that he understood the consequences of high-pressure gas entering a low-pressure system, closed valve D-3 as soon as he realized that high-pressure gas had entered the low-pressure system.

IV. EMPLOYEE TRAINING

Training of gas operations section (GOS) personnel is primarily on-the-job training supplemented by technical handouts and a manual containing detailed descriptions of work they are to perform. According to a GOS manager, the only training in responding to emergencies that GOS personnel receive is on the job. He said that he expects the supervisors who work for him to know from experience what to do and that he does not instruct them in how to respond to an over-pressure emergency. GOS employees are not evaluated or tested to see if they are aware of and understand the emergency actions expected of them.

The GOS employees who did the work at the Erie & Green station acknowledged that they had been trained in regulator inspection and maintenance through on-the-job instruction, technical handouts, and a March 1991 2-day class on the manual that describes the maintenance and inspection work to be performed. One of the crewmembers involved in the accident stated that he knew from his training that when the water blew out of the manometers, it was because of the presence of high-pressure gas; but none of the crewmembers acknowledged having been trained in responding to emergencies, including ones involving high-pressure gas entering a low-pressure system.

A review of the *Gas Operations Training Manual* revealed that it does not tell employees how to recognize or respond to those emergency situations they are likely to encounter. It does not tell supervisors the extent of their authority, nor does it refer to the company's emergency operating plan (EOP). Moreover, the EOP does not address over-pressure situations or define an emergency situation. The EOP has only one instruction for GOS personnel: "the employee is to call the superintendent."

Before this accident, the Illinois Commerce Commission (ICC) recognized the need to improve the training of Peoples' GOS employees. A 1988 management audit report[6] mentioned the lack of training at Peoples. The report rated the operations training as unsatisfactory and said:

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[6]The audit was performed for the ICC by Richard Metzler & Associates, an independent contractor.

> PGL has an extensive and well developed technical training program in place for its distribution and service department personnel. But [it] has not developed formal training and qualifications programs for its gas operations personnel.

Peoples accepted the ICC's recommendation that it establish formal training for GOS personnel. Peoples developed a 2-day training course for its vault inspectors, vault mechanics, and junior vault inspectors, which went into effect in March 1991. The training covered the operation of various regulators and control valves, and it provided an opportunity for hands-on practice in regulator inspection and adjustments. However, the training still did not provide GOS personnel with information on abnormal conditions and emergency procedures.

In December 1991, the ICC evaluated Peoples' efforts to implement the ICC's recommendations and noted that Peoples had developed a manual and had conducted formal training on the manual for its GOS employees. However, the ICC decided that the GOS still did not have minimum training and qualification standards:

> While the *Gas Operations Training Manual* is an adequate reference guide and some training has been conducted for vault inspectors and vault mechanics, there is no evidence that PGL has established minimum training qualifications for any job category, developed a schedule of which personnel should attend training sessions, or produced any goals for the GOS training function.

On October 14, 1992, Peoples told the Safety Board that GOS management personnel, along with management personnel in the distribution and service departments, will be trained in responding to emergencies. In a classroom setting, participants will analyze hypothetical situations and discuss the appropriate actions to be taken, and their analyses will be critiqued. Additional training is planned for all GOS members. All will participate in refresher training in early 1993. Junior vault inspectors will be required to have additional training and pass tests before they can become vault mechanics.

Peoples also told the Safety Board that its GOS personnel had been counseled after the accident regarding reacting to over-pressure situations. Peoples also plans to revise its *Gas Operations Training Manual* to include procedures for inspecting a district regulator only, for inspecting a monitor regulator only, and for inspecting both regulators on the same day. The revised manual will also reflect the changes implemented in the design and use of bypasses.

The Safety Board believes that Peoples should institute formal classroom training, both initial and recurrent, for its GOS employees in how to recognize and correctly respond to emergency situations.

The Safety Board also believes that the planned revision of the *Gas Operations Training Manual* should include instructions on how to eliminate or reduce a threat to public safety by taking such actions as closing valves, monitoring pressure, and evacuating people from hazardous locations.

The need to improve gas industry employee training is not unique to Peoples; it is a national problem. As a result of two accidents in Kentucky,[7] the Safety Board recommended that the Research and Special Programs Administration (RSPA):

> P-87-2
>
> Amend 49 *Code of Federal Regulations* (CFR) Parts 192 and 195 to require that operators of pipelines develop and conduct selection, training, and testing programs to annually qualify employees for correctly carrying out each assigned responsibility which is necessary for complying with 49 CFR Parts 192 and 195 as appropriate.

On March 23, 1987, RSPA issued an Advanced Notice of Proposed Rulemaking (ANPRM), Docket No. PS-94, entitled "Pipeline Operator Qualifications." The purpose was to improve the competency of operator personnel, to establish licensing/certification of operators, and to establish minimum training and testing standards for employees.

In an April 7, 1987, letter, the Safety Board emphasized its support of the ANPRM by pointing out that between 1978 and 1986 it had issued 110 safety recommendations calling for the kinds of improvements suggested in the ANPRM. On June 24, 1987, because of the issuance of the ANPRM, the Safety Board classified Safety Recommendation P-87-2 as "Open--Acceptable Action." Four years later, in an October 18, 1991, letter, RSPA advised the Safety Board:

> RSPA will soon issue a Notice of Proposed Rulemaking (NPRM) setting qualification standards for personnel who perform, or directly supervise the performance of the operations, maintenance, and emergency response functions of gas pipelines, hazardous liquids pipelines, and carbon dioxide pipelines.

However, RSPA did not issue the NPRM; and on April 9, 1992, it advised the Safety Board that it had been directed to "refrain from issuing any proposed or final rules for a 90-day period. This initiative may slow the development of regulations, including those undertaken as a result of NTSB recommendations." The January 28, 1992, direction that all Federal agencies, including RSPA, received advised that they should not issue proposed or final rules unless the rules were subject to statutory or judicial deadlines, responded to emergencies that posed an eminent danger to human safety, or fostered economic growth. In the same letter, all agencies were directed "to evaluate existing regulations and programs and to identify and accelerate action on initiatives that will eliminate any unnecessary regulatory burden or otherwise promote economic growth." On April 29, 1992, the January direction was extended for 120 days, and on September 15, 1992, it was extended for a year.

In a letter dated December 24, 1992, RSPA advised the Safety Board that with the passage of the Pipeline Safety Improvement Act of 1992, (PL-102-508) and its requirement that operators test employees for qualifications, it will proceed with a

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[7]Pipeline Accident Report--*Texas Eastern Gas Pipeline Company Ruptures and Fire at Beaumont, Kentucky, on April 27, 1985, and Lancaster, Kentucky, on February 21, 1986* (NTSB/PAR-87/01).

rulemaking under the terms of the regulatory review directive, which exempts those rules that are statutorily mandated. RSPA further noted that if the regulatory review directive is lifted, this rulemaking will become a program priority.

RSPA has already had almost 5 years to establish employee qualification standards, and the Safety Board believes that achieving this objective should be a RSPA priority. The Board believes that RSPA should consider the rulemaking a priority regardless of the directive, because the directive does not pertain to safety regulations and rulemaking mandated by legislation. The Safety Board remains firmly convinced that the recommended training, qualification, and testing requirements and standards are essential and urges RSPA to act expeditiously to amend the CFR to require that pipeline operators periodically train and test all employees assigned responsibilities that could affect public safety. Pending further action by RSPA, Safety Recommendation P-87-2 has been classified as "Open--Unacceptable Response."

V. OVER-PRESSURE PROTECTION DURING REGULATOR INSPECTIONS

When inspecting and maintaining regulators, Peoples, like much of the pipeline industry, often uses a manually operated bypass valve, as valve D-3 was, instead of an automatic pressure-control device to regulate the gas pressure. The Safety Board believes that such a valve is an acceptable substitute only if the employee who is operating it is (1) adequately trained, (2) at the valve, (3) constantly viewing a gauge measuring the outlet pressure, (4) without other duties or obligations, and (5) able to immediately alter the position of the valve as needed to maintain a safe system pressure.

On the day of the accident, no crewmember met any of the criteria stated above. The crew, including the crew supervisor, had not been adequately trained, particularly in recognizing and reacting to excess pressure in a low-pressure distribution system. No one was explicitly responsible for constantly monitoring the downstream pressure, and no one was constantly at the valve. Although one or more of the crewmembers were in the monitor vault, which also had a valve that could be used to control the gas pressure, they were there to inspect and maintain the monitor regulator; they were not specifically responsible for monitoring the manometer and adjusting the valve as necessary.

With modification, the system pressure could have been automatically controlled by using a regulator on the bypass line, by using a relief valve on the low-pressure distribution system, or by separately bypassing each regulator so that one of the regulators would remain in service while the other was being inspected. The system pressure could have been automatically controlled without modification by performing the inspection when the demand for gas was low, such as during the summer. Had the regulators been inspected at such a time, the Chicago & Carpenter station probably could have supplied enough gas for the entire River West area; consequently, there would have been no need to use the bypass line.

On October 14, 1992, Peoples told the Safety Board that it was taking the following steps: (1) Using a computer-supported analyses system and field observations to identify the stations that can be inspected and maintained without the use of a bypass valve. (2); Revising the maintenance schedules to maximize the number of stations that can be inspected and maintained without the use of a bypass valve. (3); Not inspecting a station until it is modified if, in its unmodified form, the district and monitor regulators cannot be separately bypassed;

(4) Designing all new and replacement regulator stations in such a way that the monitor and district regulators can be separately bypassed.

Until Peoples completes the above actions, it probably will be necessary to use a bypass at times to maintain pressure in gas systems downstream of regulator stations. Even after the modifications have been made, it may be necessary to use bypasses during emergencies. Therefore Peoples should implement procedures that will ensure that over-pressure control is maintained should a bypass line be used during regulator inspections.

After the accident, Peoples abandoned the River West low-pressure distribution system and installed a high-pressure distribution system. The high-pressure system uses regulators with internal relief valves or two regulators in series on each customer service line, thereby minimizing the chance that a single failure will over-pressure the entire system. Also, the company has converted the three other distribution systems that were small, isolated, and low-pressure, as was the River West system, to high-pressure systems. Peoples has also installed excess flow valves on each single high-pressure customer service line in the River West area that has a gas demand of less than 1300 ft^3/hr, as well as doing the same for the other low-pressure systems that it converted to high-pressure.

VI. CUSTOMER EDUCATION

How quickly people react in an emergency can significantly affect their chances of surviving. Consequently, customers should be educated before an emergency occurs about how to recognize and react to it. To that end, Peoples mails bulletins to its customers that often include gas safety information. Peoples also publishes a booklet, *Natural Gas Safety Guidelines*, that is available in three different languages at the company's neighborhood offices. It is the main form of safety information that Peoples gives its customers. Each receives a copy when his/her gas service is initiated. The booklet contradicts itself in explaining how to react to a gas emergency.

One section, "Helpful Information about Natural Gas," tells the customer to notify Peoples immediately any time he/she suspects a gas leak because the strength of the odor does not indicate the seriousness of the problem. Yet another section, "What To Do If You Suspect a Gas Leak," says that the customer should take certain actions before calling the gas company and that it is possible to judge the seriousness of the problem by the strength of the odor. If the odor is faint, the booklet says, the customer should call the gas company only if he/she cannot find the source of the leak. If the odor is "strong and persistent," the booklet cautions, the problem could be more serious, so the customer should take such measures as turning off all pilot lights and evacuating the building before calling the company. According to a third section, "What About the Danger of Fire and Explosion," "the best action to take in dealing with a suspected serious gas leak is to contact the gas company immediately."

Although the booklet, is obviously well intended, the Safety Board finds it deficient because it presents conflicting advice and because it suggests that the only warning of danger that a customer may receive is the odor of the escaped gas. Yet some of the customers involved in this accident heard loud, unusual noises coming from their gas appliances and saw pilot or burner flames reach unusual heights (up to 12 inches). These customers made these observations before they smelled any gas, and in some cases, they never smelled gas. Customers need to be told that there

are numerous warnings about potential danger whether or not they smell gas, and that such warnings should alert them to leave the premises and notify the gas company.

The Safety Board believes that Peoples should revise its *Natural Gas Safety Guidelines* to include clear, concise, consistent, prominently-displayed instructions about what a customer should do when confronted with a potential hazard.

The Safety Board does not believe that Peoples has done an adequate job of making its customers aware of the safety information in the booklet and of the importance of that information to their safety. After the accident, Safety Board staff received information from 22 gas customers who had been involved. Only 2 of the 22 customers recalled seeing any safety information distributed by Peoples. Six others were unsure whether they had seen any of the information, and the other 14 stated that they had seen none.

Safety Board staff reviewed Peoples' customer bulletins issued during the last 2 years and found that they did not mention the booklet. Peoples should expect its customers to need periodic reminders about the information in the booklet and its importance. Moreover, Peoples should recognize its responsibility for motivating its customers to read the booklet and follow its advice.

The Safety Board previously addressed the issue of public education when it issued Safety Recommendation P-90-21 to RSPA:

> Assess existing gas industry programs for educating the public on the dangers of gas leaks and on reporting gas leaks to determine the appropriateness of information provided, the effectiveness of educational techniques used, and those techniques used in other public education programs and based on its findings, amend the public education provisions of the Federal regulations.

The Board made the recommendation on April 20, 1990, after reviewing the 1988-1989 accidents in Kansas City and Topeka, Kansas.[8] In September 1990, RSPA said it would "explore sources of funding available for assessing existing gas industry programs for educating the public on the dangers of gas leaks and the importance of reporting leaks." It said it would, if funding were available, ask its Transportation System Center in Cambridge, Massachusetts, to do the assessment. In response the Safety Board classified Safety Recommendation P-90-21 as "Open--Acceptable Response."

However, in early 1992, RSPA stated that funding had not been available in 1991 or 1992:

> In light of current budget constraints, we view such an assessment as a low priority for funding. We believe that trade associations such as the American Gas Association should more appropriately take responsibility to take the lead for assessing gas industry public education programs.

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[8]Pipeline Accident Report--*Kansas Power and Light Company Natural Gas Pipeline Accidents, September 16, 1988, to March 29, 1989* (NTSB/PAR-90/03).

RSPA thought that the safety recommendation should be reclassified as "Closed--Reconsidered."

On October 29, 1992, the Safety Board told RSPA staff it would be inappropriate for RSPA to delegate to an industry association the responsibility for assessing public education programs. RSPA agreed to reconsider what action it might take to achieve the objective of the safety recommendation. According to a December 24, 1992, letter from RSPA, RSPA is preparing an advisory bulletin directing operators to review and assess their continuing education programs aimed at their customers and the public. RSPA noted in the letter that it would continue to work with the American Gas Association and other trade associations in this regard because it believes that they have a major role to play in assessing the effectiveness of industry public awareness programs and informing operators of especially persuasive approaches. Pending completion of the advisory bulletin and review by the Safety Board, Safety Recommendation P-90-21 will be classified as "Open--Acceptable Alternate Response."

VII. CONCLUSIONS

1. The low-pressure gas distribution system serving the River West area became over-pressured because either the Peoples gas operations section supervisor turned the bypass valve in the wrong direction during a routine inspection or debris in the bypass valve became dislodged and because of the subsequent failure of the gas operations section crew to properly monitor and control the pressure of the gas being supplied to the system from the Erie & Green station.

2. The accident could have been prevented or the consequences could have been reduced had someone from the gas operations section crew, particularly the supervisor, promptly closed either valve on the bypass line when the pressure change was observed.

3. Peoples did not adequately train its gas operation section employees in recognizing and responding to abnormal situations, nor did it provide them with adequate emergency procedures.

4. Peoples' *Natural Gas Safety Guidelines* gives conflicting and inadequate information on how its customers can recognize and properly respond to potential gas emergencies.

5. The emergency response of the city of Chicago and of Peoples' gas-service employees to this accident was well executed and coordinated.

6. Actions taken by the Research and Special Programs Administration in establishing employee training and qualification standards have been inadequate.

VIII. PROBABLE CAUSE

The National Transportation Safety Board determines that the probable cause of the over-pressure accident and the resulting losses was the failure of Peoples Gas Light Coke Company to adequately train its gas operations section employees in recognizing and correctly responding to abnormal situations, which consequently led to the failure of the gas operations section crew to properly monitor and control

the pressure of the gas being supplied to the low-pressure gas system during a routine inspection. Contributing to the cause of the accident was the Research and Special Programs Administration's failure to promulgate requirements for gas system employee training and qualification standards.

IX. RECOMMENDATIONS

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

--to Peoples Gas, Light and Coke Company:

> Train gas operations section personnel and institute recurrent training in recognizing and correctly responding to abnormal situations, including over-pressured pipelines. (Class II, Priority Action) (P-93-1)
>
> Develop procedures to ensure that the maximum safe system pressure is not exceeded when the pressure in a gas system is being manually controlled. (Class II, Priority Action)(P-93-2)
>
> Revise the *Gas Operations Training Manual* and the emergency operating plan to clearly instruct employees on how to recognize and eliminate or reduce a threat to public safety by taking such actions as closing valves, monitoring pressure, and evacuating people from hazardous locations. (Class II, Priority Action)(P-93-3)
>
> Revise *Natural Gas Safety Guidelines* so that it provides consistent, clear, concise information to the customers on how to recognize and correctly respond to potential gas hazards. (Class II, Priority Action)(P-93-4)
>
> Distribute to customers the revised *Natural Gas Safety Guidelines,* encourage them to read and retain it, and periodically remind them of its availability. (Class II, Priority Action)(P-93-5)

--to the American Gas Association and the American Public Gas Association:

> Inform member companies of the circumstances of this accident and urge them to (1) review and improve their employee guidance and training programs on recognizing and responding to abnormal situations, (2) assess the appropriateness of their procedures for using bypass valves to maintain pressure control during regulator inspections, and (3) assess the effectiveness of their programs for educating the public about recognizing and responding to potential gas emergencies. (Class II, Priority Action) (P-93-6)

In addition to the above recommendations, the Safety Board reiterates to the Research and Special Programs Administration:

P-87-2

Amend 49 *Code of Federal Regulations* (CFR) Parts 192 and 195 to require that operators of pipelines develop and conduct selection, training, and testing programs to annually qualify employees for correctly carrying out each assigned responsibility which is necessary for complying with 49 CFR 192 and 195 as appropriate.

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

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January 5, 1993