

**Public Version**

**Final  
Report on an Investigation of  
Peoples Gas Pipeline Safety Program**

**Presented to the:**

**Illinois Commerce Commission**

**By:**



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## Executive Summary

The Illinois Commerce Commission (ICC) contracted with The Liberty Consulting Group (Liberty) to perform an investigation of Peoples Gas Light and Coke Company (Peoples Gas) concerning the degree to which the company complied with federal and state regulations, and the company's conformance with industry best practices. The genesis of the investigation was problems the ICC Staff discovered with Peoples Gas' corrosion control program. However, in addition to corrosion control, the ICC requested that Liberty investigate other areas including leakage surveys, emergency leak report response, valve maintenance and valve spacing, mapping, and pressure regulation.

During the period from May 2007 through the present, Liberty acquired information from Peoples Gas, interviewed employees, observed field activities, conducted inspections, and took corrosion control readings. This report presents the results of Liberty's investigation.

Liberty found many areas in which Peoples Gas has considerable room for improvement. Common threads for the deficiencies were that (1) safety-related programs such as leak management and excavation damage prevention did not have someone who had overall ownership and responsibility, (2) there was insufficient staffing in some areas such that Peoples Gas was not performing important activities like field supervision, (3) training for many of the safety-related programs was not sufficient, and (4) Peoples Gas did not monitor and measure its own performance and identify areas needing improvement.

Liberty presents its findings and recommendations in five general areas.

- System Integrity
- System Operations
- Construction
- Operator Qualifications and Quality Assurance
- Performance

### System Integrity

The entire natural gas industry has undertaken infrastructure replacement programs to improve safety and service reliability. The priorities that Peoples Gas assigned to component replacements do not appropriately consider vulnerability and risks. It needs to assign a higher priority to components with a higher probability and consequence of failure such as cast iron pipe and services near schools, hospitals, and nursing homes.

Excavation damage to pipeline underground facilities is one of the leading causes of pipeline failure. In addition to not having singular management oversight and ownership of Peoples Gas' program in this area, Liberty found several program deficiencies. For example, Peoples Gas is not using safe and accurate locating and marking practices prior to excavations and the training given to locators is deficient. Peoples Gas does not measure its own performance in the area of excavation damage prevention, and Liberty found that Peoples Gas' performance does not compare well with peer utilities.

Corrosion is an electro-chemical reaction. Pipeline personnel can take electrical readings at test stations for buried pipelines to determine whether conditions conducive to corrosion exist. Liberty found that Peoples Gas' readings were inaccurate and that corrective actions were not timely. Personnel in the corrosion control area were inexperienced and while Peoples Gas' training for corrosion control appeared to cover the appropriate topics, it did not prove to be effective in the field.

### **System Operations**

Regulations require certain tests and inspections of important pipeline components such as valves and regulators. Liberty found that Peoples Gas completed its regulator and vault inspections in a timely fashion but did not complete all scheduled valve inspections. Concerning odorization of the gas in its system, Peoples Gas does not focus enough attention and test for odorant at the extremities of the system.

While there were some areas in which it could improve, Liberty found that Peoples Gas had a documented emergency plan, adequate emergency procedures, and employee training that met regulatory requirements.

Liberty found that Peoples Gas' leak response procedures are comprehensive and that its leak survey practices are effective. However, Liberty also found some deficiencies in Peoples Gas' leak management practices and concluded that the leak backlog at the end of the year has been too high.

### **Construction**

In its construction work, Peoples Gas uses clear and comprehensive specifications. However, Peoples Gas' inspections of contractor construction and its verification of contractor qualifications need improvement.

### **Operator Qualifications and Quality Assurance**

The safe and reliable operation, maintenance, and construction of the gas delivery system requires good procedures, adherence to those procedures, qualified personnel, and a quality work culture. An effective Quality Assurance (QA) program can help meet these requirements. Peoples Gas does not have an acceptable QA program. It relies too heavily on normal supervisory duties for which Peoples Gas' supervisors do not have sufficient time.

Peoples Gas does have an acceptable Operator Qualification plan. It effectively uses some practical tests in determining employees' abilities to perform certain tasks, and should apply this technique to other areas. Nevertheless, Liberty has several suggestions for improving the implementation of and training for operator qualification.

Liberty found that General Supervisors do not spend enough time in the field with their crews. To cure this important problem, Peoples Gas needs to realign responsibilities and/or hire additional supervisors.

Peoples Gas uses several computer systems that are cumbersome and detract from performance in a number of areas. The company is in the process of replacing these systems.

### **Performance**

Peoples Gas does not effectively use performance measures. Liberty's comparative analysis showed that Peoples Gas' performance in several areas was worse than other utilities in a peer group.

# **I. Introduction and Overall Observations**

## **A. Background**

Peoples Gas Light and Coke Company (“Peoples Gas”) is a gas distribution utility serving about 840,000 customers in the City of Chicago. In 2007, Peoples Energy Corporation, the holding company that owned Peoples Gas, merged with WPS Resources to become Integrys Energy Group, Inc.

Title 49 Code of Federal Regulations Part 192 (49CFR192) prescribes minimum safety requirements for pipeline facilities and the transportation of gas. Subpart I of the Code provides requirements for corrosion control. Corrosion is the deterioration of metal pipe. A reaction between the metallic pipe and its surroundings causes corrosion, which results in pipe deterioration and possible leaks. The federal regulations and the Illinois Administrative Code require that operators of pipeline systems, such as Peoples Gas, establish procedures to implement and maintain corrosion control programs for their piping systems. These procedures should include design, installation, operation, and maintenance activities of a cathodic-protection system. Persons qualified in pipeline corrosion control methods must carry out these procedures. Starting in January 2004, pipeline safety inspectors of the Illinois Commerce Commission (“ICC” or “Commission”) found problems with records and test points associated with Peoples Gas’ corrosion controls.

The ICC sought to contract with a vendor to review and evaluate Peoples Gas’ overall operations and maintenance activities and its pipeline safety program to determine the:

- (1) degree to which the company was in compliance with federal and state regulations, and
- (2) conformance of those activities and program with industry best practices and best practices determined by the ICC Staff in consultation with Peoples Gas.

To meet these objectives, the ICC issued Request for Proposals on December 20, 2006. On April 17, 2007, the ICC and The Liberty Consulting Group (“Liberty”) executed a contract to conduct the investigation.

This report presents the results of Liberty’s investigation.

## **B. ICC Requirements**

The Illinois Pipeline Safety Act and 49CFR192 require far more than just corrosion control procedures. An effective pipeline safety program should include, for example, excavation damage-prevention measures, accurate records, an operator qualification program, an emergency plan, and sound engineering and construction standards and specifications. A utility the size of Peoples Gas should know its infrastructure and the threats to that infrastructure. It should have prioritized the risks and implemented measures to mitigate them. It should measure performance, evaluate the effectiveness of its programs, and make changes to practices as needed.

The ICC specified that the pipeline safety investigation, at minimum, should include:

- Corrosion Control

- Review Peoples' corrosion control procedures for adequacy and recommend changes to Peoples' procedures where necessary, including internal, external, and atmospheric corrosion. The review should at least include:
  - Testing procedures
  - Remedial action procedures
  - Stray-current procedures
  - Documentation procedures
  - Troubleshooting procedures
  - Test stations
  - Anode placement
  - Rectified systems
  - Interference bonds.
- Conduct testing and analysis of a representative sample of corrosion control segments requiring annual and ten-year monitoring, including complete verification to ensure that the corrosion control program accounts for all steel main segments.
- Review Peoples' corrosion control training and qualification programs and the training and qualification of current personnel for adequacy and recommend changes where necessary.
- Leakage Surveys
- Emergency Leak Report Response
- Valve Maintenance and Valve Spacing
- Mapping
- Pressure Regulation
- All other application requirements of 49CFR192, the Illinois Gas Pipeline Safety Act [220 ILCS 20], and industry best practices.

The ICC required that the investigation produce a report that presents Liberty's findings regarding the physical condition of Peoples Gas' pipeline facilities, its overall pipeline operations, maintenance, and construction activities, and the qualifications and training of its field personnel. The ICC wanted Liberty's report to include recommendations regarding the actions that Peoples Gas should take to bring its program into compliance with federal standards and industry best practices.

### **C. Liberty's Investigation and Report**

Liberty's investigation began with an introductory meeting with Peoples Gas in May 2007. Liberty also submitted requests for information and interviews with Peoples Gas' employees. During the course of the investigation, Liberty submitted and Peoples Gas responded to over 250 requests for information. Liberty interviewed many of Peoples Gas' employees and some city and other officials who interface with Peoples Gas. Liberty also observed field activities, inspected Peoples Gas' facilities, monitored training classes, and conducted independent verification of Peoples Gas' corrosion-control testing and other programs. Consultants from

Liberty were on site at Peoples Gas during portions of every month from June 2007 through November 2007. Liberty conducted additional, follow-up site visits and interviews in January, April, and May 2008.

Liberty organized the investigation in six task areas:

- Excavation Damage Prevention
- Corrosion Control
- Management and Maintenance of System Assets
- Operator Qualifications
- Construction
- System Support and Records

Following this section, Liberty provides a summary of its overall observations resulting from the investigation and an index of the recommendations contained in this report. The remaining chapters of this report and the topics covered by each chapter are the following:

- II. System Integrity
  - A. Mains and Services
  - B. Excavation Damage Prevention
  - C. Corrosion Control
- III. System Operations
  - A. Pressures, Valves, Regulators, and Odorization
  - B. Emergency Response
  - C. Leak Management
- IV. Construction
- V. Operator Qualifications, Quality Assurance, and Documentation
  - A. Operator Qualifications
  - B. Quality Assurance
  - C. Programs, Maps, and Records
- VI. Performance
  - A. Performance Measures
  - B. Comparative Analysis

## **D. Overall Observations**

Peoples Gas did not exhibit strong performance in any of the areas Liberty examined. It is particularly weak in corrosion control, excavation damage prevention, and performance monitoring and measurement. Organizational and staffing issues are at the root of these weaknesses.

The Vice President, Field Operations, is responsible for field activities and construction, including most safety-code requirements. There is no specific management-level ownership and responsibility for damage prevention, corrosion control, leak management, operator qualifications and training, and quality assurance and performance monitoring. The major driver behind Peoples Gas' organization and operations appears to be cost minimization. The three district shops are autonomous and exhibit inconsistencies. A lack of adequate staff was evident



from General Supervisors not in the field at job sites, too few engineers to support field operations, training instructors with too many non-training duties, and construction inspectors assigned to too many crews.

The following are additional, overall observations:

- With some exceptions, Peoples Gas' plans, programs, and procedures are acceptable.
- Peoples Gas needs to improve the training function in a number of areas, including a more extensive use of practical examinations.
- Peoples ranks poorly relative to its peers on safety-related issues.
- Records management and computer support is fragmented and weak. Computer systems are outdated and contribute to poor reporting and performance monitoring.
- Peoples Gas has implemented very few industry best practices and is generally unaware of them.
- In addition to the general areas of weaknesses, Peoples Gas is particularly weak in more specific areas such as the replacement of service lines, the number of leak repairs, and participation in industry committees.
- Peoples Gas exhibited strengths in particular areas including:
  - The cast iron replacement program appears to be on track and addressing the right diameter mains.
  - The number of valves being maintained is good for shutdown purposes.
  - The replacement of paper charts with electronic pressure recorders appears to be a step in the right direction.
  - Replacement of district regulators with Mooney regulators<sup>1</sup> is a positive step.
  - The maximum three-year cycle for re-qualifications and training is good.
  - Peoples Gas has a core group of General Supervisors who are well respected.
  - Peoples Gas has a core level of expertise that is responsible for upholding good and positive performance.

The following chapters of this report contain many specific conclusions and recommendations. Liberty provides one general conclusion and recommendation that did not fit in any single functional area of the report.

## Conclusion

**1. The Vice President, Field Operations is responsible for field operations and construction, including most safety-code requirements, except for engineering and some support functions. There is no senior management level ownership and responsibility for some important functional areas below the level of Vice President.**

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<sup>1</sup> Mooney is a manufacturer of regulators that provide superior performance in the control of distribution pressures.

**This has several negative consequences, including fragmented decision-making, and a lack of ownership of the entire programs or individual aspects of it.**

## **Recommendation**

### **I-1 Improve the management-level organization.**

Peoples Gas should have one manager for each of the functions listed below, who would have matrix responsibility for that function for all three divisions, and report to the Vice President on that function:

- Damage Prevention
- Corrosion Control
- Leak Management
- Operator Qualification and Training
- Quality Assurance and Performance Monitoring

Peoples Gas should implement this recommendation within one year of the date of this report.

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## II. System Integrity

### A. Mains and Services

#### 1. Background and Objectives

The Code of Federal Regulations 49CFR192.613 requires that:

*(a) Each operator shall have a procedure for continuing surveillance of its facilities to determine and take appropriate action concerning changes in class location, failures, leakage history, corrosion, substantial changes in cathodic protection requirements, and other unusual operating and maintenance conditions.*

*(b) If a segment of pipeline is determined to be in unsatisfactory condition but no immediate hazard exists, the operator shall initiate a program to recondition or phase out the segment involved, or, if the segment cannot be reconditioned or phased out, reduce the maximum allowable operating pressure in accordance with Sec. 192.619 (a) and (b).*

Federal safety regulators have encouraged but not mandated distribution operators to implement cast iron main as well as bare steel replacement programs. On an individual basis, state regulators have required operators to implement such replacement programs in accordance with risk-based analyses and performance measures.

The natural gas industry has undertaken infrastructure replacement programs. Between 1990 and 2002, the industry reduced the mileage of cast iron mains by 21 percent and the mileage of bare, unprotected steel mains by 7 percent. During the same period, the industry reduced the number of bare, unprotected steel services 13 percent.<sup>2</sup>

The objectives of Liberty's investigation reported in this section were to evaluate Peoples Gas' methods for identifying system components more prone to failure and its programs to replace or phase out these components from system operation.

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<sup>2</sup> The American Gas Foundation January 2005 study entitled "Safety Performance and Integrity of the Natural Gas Distribution Infrastructure" (**AGF Study**).

## 2. Findings and Analysis

### a. Peoples Gas' System

The tables below describe the pressures and materials contained in Peoples Gas' system as of year-end 2006.<sup>3</sup>

	<b>Pressures Max./Normal</b>	<b>Mains (Miles)</b>	<b>Mains (%)</b>	<b>Services (No.)</b>	<b>Services (%)</b>
High Pressure	300/150 psig	83	2		
Medium Pressure	< 25/18-23 psig	1,734	43	155,700	30.7
Low Pressure	12"/5-7" water column	2,240	55	351,600	69.3
<b>Totals (approx.)</b>		4,000	100	507,300	100

<b>Material</b>	<b>Mains (Miles)</b>	<b>Services (No.)</b>
Cast Iron	1,664	71
Ductile Iron	314	382
Cathodically protected Steel	1,208	44,031
Plastic	839	411,608
Coated, unprotected steel		182
Bare Steel		6,735
Copper		19,852
Clear Plastic		24,439
<b>Totals</b>	4,025	507,300

### b. Main Replacement Program – Consultant Evaluation

Beginning in 1980, Peoples Gas had a series of studies performed by Zinder Engineering, Inc. (ZEI) and by Kiefner and Associates, Inc.<sup>4</sup> The ZEI studies evaluated Peoples Gas' cast and ductile iron distribution system and made recommendations for a replacement program considering safety, reliable service, and effective use of resources. Supplemental studies have evaluated the performance of Peoples Gas' cast iron replacement/retirement program including updating the replacement program recommendations. Both ZEI and Kiefner acknowledge that Peoples Gas' criteria and processes for its cast iron main retirement selection has yielded a controlled level of cast iron main diameter break, crack, and leak rates. With some exceptions noted below, ZEI and Kiefner recommended that Peoples Gas continue its current cast iron criteria and process selection application at a rate that will retire 45.6 miles of cast iron per year and result in elimination of Peoples Gas' cast iron mains by 2050. ZEI suggested continuing retirement selection policies in the following order:

<sup>3</sup> Responses to Data Requests #10 and #130.

<sup>4</sup> Response to Data Request #12, ZEI study June 3, 2002, Supplement No. 2 Volumes I & II, to report No. ER-048 Cast and Ductile Iron Pipe Replacement Study, and Kiefner's March 1, 2007, Report No. 07-23 Review of Peoples Gas Cast Iron Gas Main Replacement Program.

- Retire cast iron/ductile iron main as determined by district managers, based on break and leak history and the GMOS main segment ranking system criteria.<sup>5</sup>
- Continue to take advantage of significant system improvements and cost benefits when replacing LP cast/ductile iron main by converting to the smaller diameter MP main.<sup>6</sup>
- Coordinate cast/ductile iron main retirements and MP conversions with city-infrastructure expansion projects.
- Continue to assess system issues associated with LP main retirement to ensure areas do not become isolated and supplied by only one feed. Replacement in these areas is required to reduce risk associated with potential operating issues (*e.g.*, large outages due to regulator shutdown or third party damage).
- Eliminate potential future maintenance as land use changes by retiring cast/ductile iron main not required for supply.

Additionally, ZEI and Kiefner recommended that Peoples Gas continue its main segment ranking system to identify main segments having high break or other maintenance activities and select retirement candidates accordingly. Kiefner's report provides analysis details of the performance of Peoples Gas' cast iron system and Peoples Gas' Main Ranking Index (MRI) used since 1993 to score and to select the most vulnerable main segments for retirement. Kiefner's report, page 5, indicates that the smaller size pipes are far more susceptible to breakage than larger size pipes, and that rates of breakage and cracking bear this out. Kiefner indicates on page 9 that the 4 and 6-inch segments have accounted for 92.7 percent of the breaks and 96.0 percent of the cracks. Since 1981, Peoples Gas has retired 99.1 percent of its 4-inch and 44.8 percent of its 6-inch cast iron pipe. Of the original 120 miles of 4-inch, 8.3 miles remain distributed over fewer than 317 segments; of the original 2,424 miles of 6-inch, 1,326 miles remain. For Peoples Gas' larger pipes (16-inch and greater diameter), this subset of pipes has experienced lower break and crack rates and a joint leak rate since 1994 ranging from 0.56 to 2.13 leaks per mile. Kiefner recommends due to favorable results of MRI applications, that aside from the large diameter segments and short residual segments of the smaller diameter pipes that do not have high MRI scores that Peoples Gas should:

- Employ the present MRI threshold score of 6 as one of their criteria for segment retirement selection
- Replace all segments of 4-inch, 6-inch, and 8-inch pipe by 2036 as these sizes of pipes have accounted for over 90 percent of the instances of breakage and cracking
- Replace all segments of 10-inch and 12-inch pipe by 2050
- Replace all segments of 16-inch and larger pipe by 2080
- Maintain replacement rates for each size relatively constant until below 10 percent of the original mileage.

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<sup>5</sup> Peoples Gas' Gas Main On-line System (**GMOS**) is the primary database for the distribution system, containing histories for approximately 83,000 segments. Dynamic segmentation identifies a different main segment whenever the following segment factors change: diameter, material, pressure, the "in" street, and year installed. There are associated segment inspection requirements such as corrosion control and leak surveys.

<sup>6</sup> Low Pressure (**LP**) is a pressure in Peoples Gas' distribution system no greater than 12 inches of water column, which is slightly less than ½ psig. Medium Pressure (**MP**) in Peoples Gas' system is a pressure over 12 inches water column and less than 25 psig.

### c. Main Replacement Program as Implemented

As part of its evaluation of the condition of its cast iron pipe, Peoples Gas' field crews collect and process pipe coupons taken from pipe segments around its system using Institute of Gas Technology (IGT) procedures used in a 1978 study of cast iron pipe. The Technical Training Center processes and tests the cast iron main coupons in the lab for strength, corrosion activity, condition, graphitization, and wall loss information. They enter this information into a database that provides justification for its main replacement program, and input to GMOS' main ranking system for input to the main ranking index (MRI).

When a gas main segment receives a Main Ranking Index (MRI) rating greater than six (6), Peoples Gas will replace that segment within 12 months.<sup>7</sup> Additionally, Peoples Gas evaluates for replacement any gas main segment with an MRI greater than three (3) when it is within the limits of a City of Chicago public improvement project. Peoples Gas also indicated that field district crews might identify short lengths of cast iron or ductile iron mains that require immediate replacement due to corrosion (severe graphitization or pitting) or third-party damage and are less than 12" in diameter and less than 100 feet in length.<sup>8</sup> For instance, where Peoples Gas' field districts identify mains that require immediate attention (that are 12" or greater in diameter and 100' or greater in length), these segments are referred to and handled as a "Fast Track" project.

The following table provides summaries of the MRI ratings, number of segments and associated mileage.<sup>9</sup> Fewer than 10 segments consisting of less than one mile of pipe have had scores of greater than (6) six during 2007. This is typical of the scores for Peoples Gas' main segments for the past several years.

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<sup>7</sup> Response to Data Request #154.

<sup>8</sup> Response to Data Request #54 – Field input – immediate replacements.

<sup>9</sup> Response to Data Request #53.



**Evaluation of Main Segments Based on Main Ranking Index (MRI)**

date	Number of Miles												
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	
<b>MRI</b>													
20 & above	0.2	0	0	0		0	0	0	0	0	0	0	0
10 to 19.75	2.3	0.9	0.1	0.1	0	0	0	0.1	0.2	0.1	0	0	0
6 to 9.75	10.0	4.2	3.1	1.3	0.9	0.6	1.1	0.8	0.9	0.4	0.9	0.1	0.1
5 to 5.75	9.1	6.9	5.7	5.5	4.4	4.4	5.0	3.9	4.9	4.9	4.6	4.2	4.2
4 to 4.75	20.5	16.4	16.8	15.9	15.5	17.0	14.9	14.3	15.3	15.1	16.1	16.6	16.6
3 to 3.75	45.5	34.9	38.3	39.0	42.7	41.8	42.6	41.2	41.5	43.0	41.1	40.6	40.6
0.25 to 2.75	995.1	1044.5	1082.8	1092.6	1097.1	1102.0	1083.5	1064.9	1055.8	1047.2	1028.8	1009.4	1009.4
0	2948.5	2907.3	2855.2	2848.0	2842.2	2855.7	2875.2	2915.6	2910.9	2936.5	2977.7	2992.0	2992.0
Total	4,031	4,015	4,002	4,002	4,002	4,003	4,022	4,041	4,030	4,047	4,069	4,063	4,063

Peoples Gas uses its main ranking information, GIS, Distribution Design, and Bang-for-the-Buck processes to assist in identifying capital projects.<sup>10</sup> Peoples Gas’ system improvement projects primarily fall into four categories:<sup>11</sup>

- Replacements of Cast Iron/Ductile Iron with plastic and steel
- Upgrades from Low Pressure to Medium Pressure
- Work associated with city and state public improvement projects, resurfacing, sewer and water main projects
- System expansion projects due to increased loads.

The following table shows the remaining cast iron on Peoples Gas’ system.<sup>12</sup>

<sup>10</sup> Interview with Gas Engineering, May 15, 2008, and response to Data Request #233. Peoples Gas uses a Geographic Information System (GIS) to develop and maintain system maps of its piping network. **Distribution Design** is a group in Peoples Gas’ engineering organization that evaluates main segments as candidates for replacement. Peoples Gas has a process called **Bang-for-the-Buck** that uses spatial modeling in GIS as an aid to weigh the value of one project against another. The tool estimates the cost of a project and compares it to potential future operating and maintenance savings in order to determine a cost/value ratio.

<sup>11</sup> Interview #6, June 4, 2007.

<sup>12</sup> Response to Data Request #186.

**Remaining Active Cast / Ductile Iron Pipe (12/31/07)**

	North Shop	South Shop	Central Shop	Total
Pipe Diameter (")	Length (feet)	Length (feet)	Length (feet)	Length (miles)
2	0	0	0	0.00
4	19,769	17,477	17,776	10.42
6	3,058,492	2,197,120	1,770,760	1,330.75
8	177,314	102,095	108,759	73.52
10	3,521	51	33	0.68
12	443,666	207,540	253,551	171.36
16	344,612	224,514	216,801	148.85
20	124,829	91,453	167,242	72.64
24	124,718	116,261	125,672	69.44
30	4,216	15,944	41,239	11.63
36	41,932	68,006	36,478	27.73
48	26,811	35,891	56,978	22.67
			Total	1,939.68

The more vulnerable sizes are 4", 6", and 8" diameter pipe. The remaining pipe of these sizes in the North district suggests that it has lagged the other districts in meeting the annual cast iron elimination quota. The data contained within the "Status of Leak Indications" annual reports for years 2004 thru 2007 show that the North district experiences the highest number of new leaks received for each year.<sup>13</sup> The North district has the highest percentage (43.58 percent) of materials most vulnerable to leaks and failures, namely the 4", 6", and 8" diameter cast iron mains and experiences the highest number of leaks. For the 4-year period 2004 thru 2007, the North district experienced 42.7 percent of Peoples Gas' leaks.

**d. Service Line Replacement Program**

Peoples Gas has several service line components that are vulnerable to leaks and failures by virtue of their composition. Steel service tees installed at mains that connect dissimilar main materials such as cast or ductile iron and older steel with copper services are vulnerable to corrosion and leakage. At year-end 2006, Peoples Gas reported it has inserted 19,000 copper service lines.<sup>14</sup> Peoples Gas also has 24,000 clear plastic cellulose acetate butyrate ("CAB") service lines, a material that has shown poor performance in the industry. Peoples Gas indicates this material is brittle and susceptible to cracking and failure. Peoples Gas indicated when it has the opportunity it replaces CAB service lines. In addition, Peoples Gas has 6,000 unprotected steel service lines susceptible to corrosion leakage.

Peoples Gas also has service lines that are vulnerable by virtue of their age, although there is a substantial overlap between age-related and material-related problem service lines. Materials tend to degrade over time making them more susceptible to leaks and failures. This is especially true for older materials compared with modern vintages and materials. Peoples Gas has 28,000 services installed prior to 1960. During the period 2004 through 2006, Peoples Gas experienced an average of 680 leaks on its service lines due to corrosion, natural forces, other outside force damage, material or weld failures, and "other" leaks. It is likely that the majority of these leaks

<sup>13</sup> Response to Data Request #143.

<sup>14</sup> Response to Data Request #130.

were on these more vulnerable materials rather than on Peoples Gas’ cathodically protected service lines or its newer plastic service lines.

As shown on the table below, Peoples Gas has been reducing its more vulnerable service lines in recent years.<sup>15</sup> For unprotected steel, CAB plastic, and copper service lines, Peoples Gas recently has reduced these materials on average 1,848 annually. Peoples Gas has 51,208 of these vulnerable lines. At the current replacement rate, it will take over 27 years to eliminate the threats from its vulnerable service lines, the gas facilities closest to habitable structures. Regarding its 28,604 vintage service lines currently at least 48 years old, Peoples Gas has been eliminating them at an annual rate of 988. At this replacement rate, it will take 29 years to eliminate the threats from these old service lines, some of which will be at least 77 years old before replacement.

**Vulnerable Service Lines**

Year Ending	Unprotected bare steel	Unprotected coated steel	Clear Plastic CAB	Copper	Vintage – prior to 1960
2004	7,213	182	26,273	21,236	30,580
2005	6,957	181	25,332	20,476	29,506
2006	6,735	182	24,439	19,852	28,604
Avg. Annual Reduction	(239)	0	(917)	(692)	(988)

### 3. Conclusions

#### 1. The priorities assigned to component replacements do not appropriately consider vulnerability and risks. (Recommendation II-1)

Peoples Gas needs to re-evaluate the values assigned to the various factors in its main evaluation process. It should assign higher values to components with a higher probability and consequence of failure. Examples of those facilities that pose higher risks are cast iron and bare steel mains and services near schools, hospitals, and nursing homes. Peoples Gas should have continuing surveillance programs that include materials evaluation (bare steel, cast iron, plastic, copper, mains, services, regulators) of components more prone to failure (mains, services, tees, above ground components), and determination of leakage and damage incident rates, their vintage, and location. Furthermore, Peoples Gas’ evaluation process should ensure that the discretionary portion of its main replacement program and its service line replacement programs take into consideration the consequences should leaks or failures occur on these vulnerable facilities.

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<sup>15</sup> Response to Data Request #129.

**2. Peoples Gas implemented an industry best practice of cast iron pipe coupon sampling. However, it is unclear whether it factors the results of the program into the replacement program.** (Recommendation II-2)

Peoples Gas field crews collect and process pipe coupons taken from pipe segments around its system using Institute of Gas Technology procedures. The Technical Training Center processes and tests the cast iron main coupons in the lab for strength, corrosion activity, condition, graphitization, and wall-loss information. A database collects this information.

The collection of coupons and their evaluation is an industry best practice. It is unclear, however, whether the coupon collection is representative of main conditions in all areas of its system. Peoples Gas uses coupon evaluations directly in the Main Ranking system. Peoples Gas needs to ensure this coupon collection program continues and the results are integrated with pipe condition information reported by its field crews.

**3. Cast iron replacements in the North district lag behind the other districts.** (Recommendation II-3)

As part of its cast iron replacement program in recent years, Peoples Gas has replaced less footage in the North district compared with replacement footage for its Central and South districts. As a result, the amount of the most vulnerable 4", 6", and 8" sizes of cast iron remaining in the North district is about 40 to 70 percent higher than the other two districts. The North district also has the most reported leaks and the highest percentage of vulnerable materials. Peoples Gas needs to increase the North district replacement rate.

**4. The evaluation of service line system components for replacement is not well defined.** (Recommendation II-4)

Peoples Gas does not have defined replacement programs for its at-risk service lines. Liberty asked how Peoples Gas integrates the need to replace its higher risk service lines with main segments that it is evaluating for replacement.<sup>16</sup> Possible factors associated with service lines include age, un-sleeved and located beneath a habitable structure, geography, and material (bare steel, clear plastic, cast iron, ductile iron). However, Peoples Gas indicated that its current method is to replace CAB<sup>17</sup> and bare steel services in conjunction with its Distribution System upgrade program rather than approach it on a stand-alone basis. Peoples Gas considers several factors when determining a project's value. The number of CAB and bare steel services in the project area is one of the factors considered.<sup>18</sup> The highest priority would involve high consequence leaks, water in the LP system, and ICC requests. Peoples Gas has 51,208 of these vulnerable lines. At the current replacement rates, it will take approximately 28 years to eliminate the threats from gas facilities closest to habitable structures and some service lines will be more than 77 years old at replacement.

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<sup>16</sup> Response to Data Request #153.

<sup>17</sup> CAB is cellulose acetate butyrate service lines, a material that has shown poor performance in the industry.

<sup>18</sup> Response to Data Request #156.

## **4. Recommendations**

### **II-1 Change replacement weighting factors to assign a higher priority to vulnerable components and those with greater risks.**

Peoples Gas needs to re-evaluate the values assigned to the various factors in its main evaluation process. It should assign higher values to components with a higher probability and consequence of failure. Peoples Gas' processes should result in elimination of vulnerable facilities that could affect structures such as schools, hospitals, and nursing homes. Peoples Gas should implement this recommendation within six months of the date of this report.

### **II-2 Improve the coupon-sampling program.**

Peoples Gas should ensure that

- The coupon collection and analysis program continues
- The results of coupon sampling analyses are integrated with pipe condition information reported by its field crews
- The coupon collection is representative of main conditions in all areas of its system
- The program's results are incorporated systematically into the main replacement process.

Peoples Gas should document its evaluation of the program within six months of the date of this report.

### **II-3 Evaluate cast iron replacement policies and increase replacement rates in the North district.**

Within three months of the date of this report, Peoples Gas should document a plan for cast iron replacements.

### **II-4 Implement a systematic replacement program of vulnerable service lines.**

Within six months of the date of this report, Peoples Gas should document a well-defined plan for the systematic replacement of vulnerable service lines. Peoples Gas needs to implement a replacement program to target the more vulnerable services lines that pose the highest threat to the public.

## **B. Excavation Damage Prevention**

### **1. Background and Objectives**

Excavation damage to pipeline underground facilities is one of the leading causes of pipeline failure. Excavation damage is usually preventable and most frequently occurs when there is a breakdown in the damage prevention process. Many types of activities such as road maintenance, general construction, and homeowner actions can cause this damage. Excavation damage not only includes direct pipeline punctures, but also damage to the external coating of the pipe, dents, or scrapes that can lead to delayed failures. Damages to underground facilities can result in injury and death, as well as severe property damage and loss of vital services for homes,

businesses, hospitals, air-traffic control operations, and emergency service providers. Excavation damage often occurs when required one-call notifications are not made prior to beginning excavation, when there is a lack of adherence to safe digging practices, when there is inadequate public education and awareness, or when there is inaccurate location in marking of underground facilities.

All stakeholders, including Peoples Gas, share the responsibility for preventing excavation damage. However, operators like Peoples Gas, should take a lead role in a comprehensive damage prevention program. As examples, Peoples Gas needs to promote effective communication with excavators, support state prevention programs, be an active participant in public education, promote incentives to damage prevention compliance, and assess incidents to seek program improvements. Operators can use performance measures in program evaluation tracking, such as percentage of notifications not responded to in a timely manner, one-call notification center errors, damage by cause and responsible party, failure to mark accurately, excavation practices not sufficient, pipelines marked accurately and damage occurred, and inaccurate pipeline location in marking of underground facilities.

Under Federal regulations, the Department of Transportation's Pipeline and Hazardous Materials Safety Administration (PHMSA), Pipeline Safety Regulations, 49CFR192.614 requires that pipeline operators implement written damage prevention programs to prevent damage to their pipelines from excavation activities.

In addition, PHMSA recommends that pipeline operators like Peoples Gas, follow all consensus best practices and guidelines developed by the Common Ground Alliance (CGA). The CGA is a nonprofit organization dedicated to the promotion of shared responsibility and implementation of the "best practices" and damage prevention. In 1999, the U.S. Department of Transportation sponsored the Common Ground Study of One-Call Systems and Damage Prevention Best Practices, which addressed key elements to successful damage prevention programs in use throughout the United States and Canada.

At the nucleus of damage-prevention is the One-Call notification center. One-Call centers serve as a central communication point for anyone planning to excavate. The One-Call center alerts affected underground facility operators of the excavation plans and the location of the proposed excavation. Facility operators, such as Peoples Gas, are then responsible to locate their facilities and visibly mark their locations so that the person(s) doing excavation will be able to dig safely over and around these buried facilities. Pipeline operators can strengthen community and excavator awareness programs explaining the dangers of excavation damage and the steps that all excavators, including the public, must take prior to initiation of an excavation project.

This section reports the results of Liberty's evaluation of Peoples Gas' excavation damage-prevention program, practices, and results. Liberty sought to determine whether Peoples Gas:

- Has excavation damage-prevention programs that meet federal and state requirements
- Has effective communications, both internally and externally, regarding excavation damage prevention
- Promotes the use of one-call systems
- Is active in public education and awareness efforts

- Uses safe and accurate locating and marking practices, and whether the personnel who perform marking are appropriately qualified
- Is active in implementing best practices regarding excavation damage prevention
- Performs sound root cause analyses of failures in the excavation damage-prevention program
- Effectively uses performance measures to assess its actions regarding excavation damage prevention.

## **2. Findings and Analysis**

### **a. Peoples Gas' Damage Prevention Program**

Compliance with 49CFR192.614 can be, in part, through participation in a state one-call system. However, the operator must provide a means of receiving and recording notification of planned excavation activities, provide for temporary marking of buried pipelines in the area of excavation activity before the activity begins, and conduct inspections as frequently as necessary during and after the activities to verify the integrity of the pipeline.

The regulations require that the program include measures designed to prevent damages to underground pipeline facilities by excavation activities such as excavation, blasting, boring, tunneling, backfilling, and other operations. The program should identify on a current basis the persons who normally engage in excavation activities in the area in which the pipeline is located. The program should also provide for the general notification of these excavators and the public near the pipeline to make them aware of the program's existence and purpose and to inform them about how to learn the location of underground pipelines before they begin excavation activities. An operator may perform any of the duties required through participation in a public service program (such as a "one-call system"), but such participation does not relieve the operator of responsibility for compliance.

The Illinois Underground Utility Facilities Damage Prevention Act sets out the requirements for excavation in the state.<sup>19</sup> Under this law, any person who engages in non-emergency excavation or demolition must call the appropriate one-call system at least 48 hours before commencing any excavating activity. "JULIE," also known as the Illinois One-Call System is the one-call center that serves the entire State of Illinois, except the city limits of Chicago. "DIGGER" is the one-call center that serves within the city limits of Chicago.

Peoples Gas' Damage Prevention Program is Exhibit IX to the company's Operating and Maintenance (O&M) Plan.<sup>20</sup> It contains the following major sections:

- Scope
- Notification to Public
- Identification and Notification of Entities/Persons Normally Involved in Excavation

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<sup>19</sup> 220 ILCS 50/1 et seq. P.A. 86-0674, [http://www.illinois1call.com/law\\_policies/law.htm](http://www.illinois1call.com/law_policies/law.htm).

<sup>20</sup> Response to Data Request #2.

- Receiving and Recording Notifications of Planned Excavation Activities
- One-call Systems
- Temporary Marking Buried Pipelines/Facilities
- Leak Survey and Inspection of PGL Facilities/Pipelines in Close Proximity to Foreign Excavation/Construction Projects.

The program document also has references to other parts of the O&M Plan for additional detail on locating, marking, record keeping, and sample mailings. These references are:

- Exhibit I – General Order 0.800 (Procedure and Policies for the Prevention of Damage to Underground Gas Company Facilities)
- Exhibit I – General Order 0.820 (Marking of Above Ground Pipelines)
- Exhibit I – General Order 0.821 (Pipeline Markers)
- Exhibit VII - Section X (Public Education)
- Exhibit XIII - Operations, Section 1 (One-Call System).

Liberty found that Peoples Gas has a written program that meets the basic requirements of 49CFR192.614. It addresses all of the topics contained in 49CFR192.614 and includes participation in JULIE and DIGGER.

The O&M Plan provides (Section 1.0 Scope) that the General Manager, Field Operations, and the Vice President, Gas Supply Engineering are responsible for administering the damage prevention program. However, Liberty could find no evidence that this oversight was taking place. In practice, each of the three shops administered the excavation damage-prevention program.

## **b. One-Call Systems and External Communications**

### *1. The One-Call Systems<sup>21</sup>*

Within the Chicago city limits, DIGGER is the one-call system. The Chicago Utility Alert Network (CUAN) operates DIGGER. Outside of the city limits, the one-call system is the Joint Utility Locating Information for Excavators (JULIE).

JULIE operates 24 hours a day, seven days a week, while DIGGER operates during normal work days and hours observed by the City of Chicago. On weekends, holidays, and off-hours, Peoples Gas telephones the City of Chicago 311 Call Center to request emergency locates that may be required.

State regulation requires that anyone planning to excavate, dig, bore, pile drive, blast, grade, demolish, or disturb the earth's surface in any way must call the appropriate one-call system's telephone number and inform them of their intentions. The one-call system then electronically notifies Peoples Gas and other subscribers to the system at each subscriber's location of the caller's plans to excavate. Peoples Gas' Damage Prevention Program states that, upon receipt of

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<sup>21</sup> Response to Data Request #2, O&M Plan Exhibit IX.



the request for locations message, Peoples Gas sends a representative within 48 hours (two working days excluding weekends and holidays) to identify and mark the horizontal route/location of its underground gas facilities/pipelines if Peoples Gas has facilities in the affected area.

The JULIE or DIGGER request for location message is supposed to contain information such as the ticket or dig number, the permit number, the address of the proposed excavation, and the excavator's name, address, and telephone number. Peoples Gas' North, South, and Central Shops as well as Citywide Dispatch at Central Shop receive the transmitted messages for digs by others that could affect facilities. For emergency locate requests, Citywide Dispatch will, as required, dispatch the location to the assigned inspector or call-out personnel to perform the locate. Peoples Gas also provides the one-call system with the information necessary to complete its system database requirements. Whenever Peoples Gas revises its district boundaries or expands into new areas, Peoples Gas forwards the updated information to DIGGER and JULIE.

## 2. *External Communications*

The Damage Prevention Plan requires Peoples Gas to notify regularly the public about the purpose of the damage prevention program, how to learn whether a gas facility is near a proposed excavation, and how to request that someone mark out the facility. Peoples Gas is supposed to accomplish this notification by using customer bill inserts and the "Natural Gas Safety Guidelines Booklet."<sup>22</sup> Peoples Gas indicated that it used bill inserts on a continual basis and provided the booklet to all new customers.<sup>23</sup>

The Damage Prevention Plan also requires Peoples Gas to maintain two current lists of persons and firms normally engaged in excavation activities in the service area where Peoples Gas operates its gas transmission and distribution facilities. The two lists are for inside and outside the Chicago city limits. Peoples Gas should develop and maintain these lists from JULIE line location request records for outside the city and from City of Chicago permit recipients for inside the city.<sup>24</sup>

Early each year prior to the start of the construction season, the General Manager, Field Operations and the Supervisor, Pipeline Operations Group, should send a notice to all firms on their respective lists to inform or remind them of Peoples Gas' damage prevention program and how to request locations for underground pipelines before excavating. Peoples Gas should review and update the lists annually and on other occasions as necessary. Peoples Gas should maintain the lists in a computer database at the main office and at the Elwood Facility. The O&M Plan contains a sample letter to contractors.<sup>25</sup>

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<sup>22</sup> Response to Data Request #2, O&M Plan Exhibit IX.

<sup>23</sup> Response to Data Request #2, O&M Plan Exhibit X.

<sup>24</sup> Response to Data Request #2, O&M Plan Exhibit IX.

<sup>25</sup> Response to Data Request #2, O&M Plan Exhibit X, Exhibit 15.

Liberty obtained a list of damages to Peoples Gas' facilities by contractor<sup>26</sup> and compared it to Peoples Gas' current list of excavators, which DIGGER maintained.<sup>27</sup> There were contractors who damaged facilities and who were not on the list, demonstrating that the list is not complete and current. Peoples Gas depends on DIGGER to provide it with a list of contractors for mailings derived from permits/one-call notices and does not itself review or update the list.

Peoples Gas provided a list of incidents in which various types of excavation equipment hit their underground facilities.<sup>28</sup> For all of 2006 and 2007 through September, there were 1,452 such incidents. The one-call system was not notified in 632 (44 percent) of these incidents. Liberty concluded that Peoples Gas' communications regarding excavation damage prevention have not been effective. While communications from Peoples Gas mentioned one-call systems, they have not been effective in promoting the use of one-call systems.

Liberty requested that Peoples Gas provide the dates and materials used in training municipal workers on damage prevention in the last three years.<sup>29</sup> In July 2007, Peoples Gas responded with a letter dated November 2005. It listed training given to people from various departments of the City of Chicago. The last documented training was in April 2004. Of the 1,452 incidents in 2006 and 2007, municipalities caused 564, or 39 percent.<sup>30</sup> Liberty does not know whether Peoples Gas gave more recent training than April 2004, but it is clear that whatever training Peoples Gas provided, it has not been effective.

In addition to damage prevention, Peoples communicates with its customers about natural gas use and safety in other ways. It sends a monthly newsletter to customers, the new customer welcome kit includes a safety brochure, and bill inserts deal with topics like inside safety inspections. The web site PeoplesEnergy.com includes safety information and available home safety services. Liberty found that Peoples Gas is active in public education and awareness efforts.

### **c. Marking Practices**

#### *1. Requirements*

The Damage Prevention Plan provides for the temporary marking of buried gas facilities.<sup>31</sup> The plan indicates that a company inspector locates underground piping using electronic detection equipment and by visual verification. The inspector should be familiar with pipeline protection procedures and the company's maps and records of pipeline facilities. When at the excavation site, the inspector marks out the approximate pipeline location. The plan indicates that Peoples generally marks out the location at least one working day in advance of any excavating.

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<sup>26</sup> Response to Data Request #37.

<sup>27</sup> Response to Data Request #36.

<sup>28</sup> Response to Data Request #150.

<sup>29</sup> Data Request #35.

<sup>30</sup> Response to Data Request #150.

<sup>31</sup> Response to Data Request #2, O&M Plan, Exhibit IX, Section 6.

Additional requirements of the plan include when the inspector has difficulty locating a line electronically, he pinpoints the line by measurement or when appropriate by bar probing or by making a test hole to determine its exact location. If the excavator has or is about to start excavating before the line is located, the inspector requests a delay until the line can be positively located. In instances where the inspector is unable to locate the gas lines, he contacts a supervisor for assistance. The inspector uses plastic flags and spray paint to perform the marking.

When there are no gas facilities at the excavation site, inside the city, the inspector paints “NO GAS” where the proposed excavation is to occur. In addition, the inspector informs the excavator at the site, if present, or contacts the excavator by telephone.

Liberty noted several areas in which Peoples instructions and procedures are somewhat confusing and inconsistent with state law and DIGGER’s recommendations.

For example, sections 6.4 and 6.5 of the Damage Prevention Plan state that the distance between markers depends on the length of the job and that Peoples Gas should use a minimum of two markers or markings on all jobs. General Order 0800 states that personnel marking underground gas facilities should use a sufficient number of locate marks over mains and services to assure that the excavator can readily determine the locations of company facilities throughout the area of construction. Similarly, in the handout material for the Facility Locating and Marking class attended by Liberty on October 12, 2007, the information provided indicated that, “...enough marks should be supplied along the path of excavation.”

- Liberty believes that these documents provide insufficient guidance for locators. DIGGER’s Excavator Handbook has “Recommendations of Standardized Utility Markings in the City of Chicago” that states: “Location of markings (paint, flags, and/or stakes) **shall be** [emphasis added] approximately ten (10) feet apart...” Liberty finds this to be an acceptable practice and believes Peoples Gas should be consistent with the City’s recommendation.
- With respect to hand digging within the tolerance zone, Section 6.6 of the Peoples Gas’ Damage Prevention Plan states that the excavator should hand dig if he/she comes within 24 inches of a locate mark (a four-foot tolerance zone). Peoples’ General Order 0800 also references hand digging within 24 inches either side of a mark. The tolerance zone is defined by Law (220 ILCS 50/2.7) as 3 feet plus the width of facility or as normally stated, 18 inches on either side of facility plus the width of the facility.<sup>32</sup> While providing a wider tolerance zone, Liberty finds Peoples Gas’ documents to be confusing and inconsistent with State Law.

## 2. *Emergency Markout Requests*

Excavators are permitted to make emergency locate requests for immediate markouts. Emergency locate requests are permissible when there are conditions constituting an immediate danger to life, health or property, or utility outages which require immediate repair or action. Locators are required to respond to emergency requests within two hours. To prevent abuse of

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<sup>32</sup> Illinois Underground Utility Facilities Damage Prevention Act 220 ILCS 50/11 section 11 D.

this type of request, anyone who requests an emergency markout from JULIE in a non-emergency situation is subject to a penalty of up to \$2,500 for each offense. DIGGER does not have a similar penalty provision, although it does provide for general penalties for “permit violations.”

Liberty observed several markout tickets for non-emergency work (sidewalk repairs) that had been called in as emergency locates. DIGGER did not screen those calls out as non-emergency work when it took the calls. In Liberty’s experience, this is common practice in situations where one-call operators and contractors are not educated about the purpose of the emergency locate provision and where the provision is not enforced.

### 3. *Peoples Gas’ Marking Practices*

The Pipeline and Hazardous Materials Safety Administration (PHMSA) emphasized the importance of accurately locating and marking underground pipelines before excavation activities take place.<sup>33</sup> It urged operators to use industry best practices developed by the Common Ground Alliance and to make sure that individuals locating and marking pipelines have the necessary knowledge, skills, and abilities. These individuals should be familiar with state and local requirements and should have received appropriate training. A standard for training is that outlined by the National Utility Locating Contractors Association (NULCA).

Peoples Gas requires its corporation inspectors (locators) who are usually Operator Apprentices to attend classroom and on-the-job training before the initial locate. Specific locate training includes a one-day session with classroom and practical demonstration sessions. A second day of locate training includes the use of the Navigate system and information on how to record completed locates. There is a re-qualification requirement every three years that involves a one-half day written examination.

Liberty reviewed and compared NULCA’s training standards and Peoples Gas’ training materials. In contrast to Peoples’ requirement of two days of training, NULCA’s “Professional Competence Standards for Locating Technicians” includes 11 subject units that take approximately two weeks to complete. Based on this comparison and on its field observations, Liberty concluded that Peoples Gas does not meet PHMSA minimum requirements or industry best practices regarding the training of locators.

Peoples Gas provided a list of incidents in which various types of excavation equipment hit their underground facilities.<sup>34</sup> For all of 2006 and 2007 through September, there were 1,452 such incidents. The one-call system was notified prior to 820 of these incidents. Of these 820, the marks were not visible in 193 (24 percent) incidents. The marks were not correct in 320 (39 percent) incidents, and the root cause identified by Peoples Gas related to marking or location in 180 incidents. These data show that either Peoples Gas was not responding to locate requests or that the locating and the training given to locators was not adequate, or both.

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<sup>33</sup> Pipeline and Hazardous Materials Safety Administration (PHMSA) Advisory Bulletin (ADB-06-03).

<sup>34</sup> Response to Data Request #150.

The City of Chicago requires excavators to call “DIGGER” at least 48 hours prior to the start of planned excavation activities. Peoples Gas receives a daily notification from “DIGGER” of excavation activities proposed for this timeframe.<sup>35</sup> Upon receipt of the request for locations message, Peoples Gas sends an inspector within 48 hours to identify and mark the horizontal route and location of its underground gas facilities or pipelines in the affected area.<sup>36</sup>

Liberty reviewed Peoples “On-Time Locate Percentage” for the sample period of January 1, 2007, through January 12, 2007, for all locators.<sup>37</sup> Out of a total number of completed locates for this period of 4,026, only 2,400 were completed on time. This is a 60 percent on time locate rate, which Liberty believes is highly unacceptable, and poses a high level of risk to public safety.

In August 2007, Liberty observed Peoples Gas personnel marking in the field. Liberty noted several specific violations of code, procedure, or good practice. These included:

- Contractors had begun work prior to Peoples Gas’ mark-outs of excavation locations.
- Locators did not mark-out locations consistently and in conformance with General Order 0800.
- Locators were uncertain about and inconsistent in how they use follow-up locates.
- Locate tickets were marked overdue when the locators received them.
- Locators were unaware of the possible use of cameras to document their locate work.
- A discrepancy between company records and the actual field installation was not reported to the General Supervisor.
- Locators were not contacting contractors to clarify nature of work activity.
- Tickets marked as emergency were not actually emergency tickets.
- Unless there was damage, Peoples Gas does not perform any trailing audits of the accuracy of field locates.

For all of the reasons cited above, Liberty concluded that Peoples Gas is not using safe and accurate locating and marking practices and that the personnel who perform marking are not adequately trained.

#### **d. Damage Prevention Performance Issues**

##### *1. Directional Boring*

A study by the National Transportation Safety Board (NTSB) cites an accident in Indianapolis it investigated in which directional boring was identified as the direct cause of the accident. The accident involved an explosion that resulted in one fatality, one injury, and extensive damage to a residential subdivision. In that report, NTSB also referred to several accidents documented in trade literature (which NTSB did not investigate) involving directional boring, including a gas explosion which destroyed a home in Seattle, a water main break in northern New York state

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<sup>35</sup> Response to Data Request #2, General Order 0800.

<sup>36</sup> Response to Data Request #2, Exhibit IX.

<sup>37</sup> Interview, July 17, 2007.

which may have seriously weakened a roadbed, and a gas explosion in Overland Park, Kansas that destroyed four homes. The NTSB study states that:<sup>38</sup>

*Differences in soil density, rock formations, and variable torque on the drilling head often result in a directional line that does not run along a straight route. Drilling heads can be deflected by hard rock or unknown underground objects... Directional boring is not always sensitive to line hits; **it is possible for a boring equipment operator to hit a facility without being aware of the hit.** The drill bits, designed to go through rock, experience little change in resistance when going through plastic pipe or cable. This sets up a situation for hitting a gas line without knowing it; migrating gas can then collect, creating conditions for an explosion.*

Recognizing the problem, PHMSA issued an advisory bulletin in 1999 that stated, in summary:

*PHMSA is issuing this advisory bulletin to owners and operators of natural gas and hazardous liquid pipeline systems to advise them to review, and amend if necessary, their written damage prevention program to minimize the risks associated with directional drilling and other trenchless technology operations near buried pipelines. This action follows several pipeline incidents involving trenchless technology operations which resulted in loss of life, injuries, and significant property damage. It also corresponds to National Transportation Safety Board (NTSB) Safety Recommendation P-99- 1, which suggests that PHMSA \* \* \* **ensure that the operators' damage prevention programs include actions to protect their facilities when directional drilling operations are conducted in proximity to those facilities.** This advisory bulletin emphasizes the importance of having procedures to mitigate the risks of directional drilling and other trenchless technology.*<sup>39</sup>

Directional boring can have serious consequences if not conducted properly. In addition to the direct, obvious consequences of rupturing a line during the boring operation, there is the additional risk of damages that do not produce immediate consequences, but which may eventually cause failure of the pipe. Such damages include damages to the pipe coating, scrapes, and dents that may weaken the wall structure of the pipe and lead to eventual failure.

Whenever a boring crosses a gas line or any other facility, a “best practice” is to dig a pothole over the gas line to determine the exact location and depth. The locating and marking process is “depth blind.” That is, a locator will mark approximately the location of a line but not the depth of the line. Peoples Gas should be inspecting boring activities to make sure the excavator is potholing or taking other measures to determine the precise location of their facilities, especially those excavators who damage their pipelines on a regular basis (e.g., City of Chicago, Groundhog Construction).

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<sup>38</sup> Safety Study-Protecting Public Safety Through Excavation Damage Prevention (Report NTSB/SS-97/01), Accident DCA97FP005).

<sup>39</sup> Pipeline Safety Advisory Bulletin No. ADB-99-04, August 23, 1999.

During the period October 2005 through July 10, 2006, there were 51 hits from a bore machine out of 1,406 total borings (about 4 percent).<sup>40</sup> There were several contractors involved, but the City of Chicago was highest with 17 hits and Ground Hog Construction next with 16.

### 2. *Inspection after Excavation Exposure*

General Order 0800, Section V, states, “All gas facilities when and if it is known that others have exposed it during excavation shall be inspected for damage to assure the integrity of company facilities prior to backfilling.” That document also gives a list of things to inspect for after construction work exposes underground pipe. However, this list does not include inspection of exposed cast iron joints. Federal regulations CFR Part 192.753(b) requires exposed cast iron joints to be sealed by means other than caulking.

Peoples Gas does not routinely inspect all exposed underground facilities, and so the company is not complying with its procedure. However, it may not be reasonable to expect that Peoples Gas to inspect every exposure location. Peoples Gas needs to develop reasonable criteria for determining when to make these inspections, modify the procedures accordingly, and then follow the procedures.

With regard to exposed cast iron joints, several Peoples Gas supervisors and shop managers were not aware of the clamping requirement.<sup>41</sup> Peoples Gas needs to revise its procedures to include this requirement, ensure that appropriate personnel are aware of it, and add the requirement to training materials.

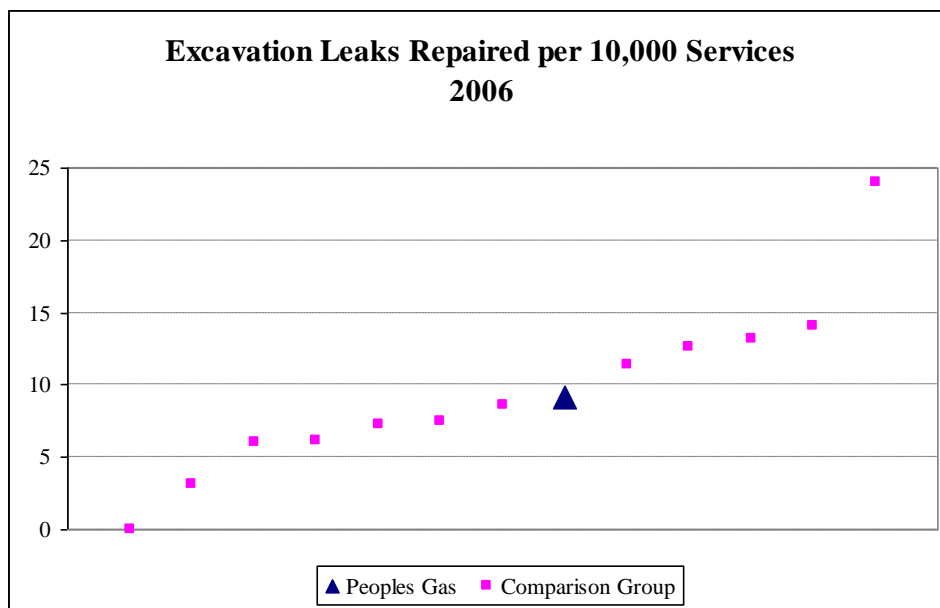
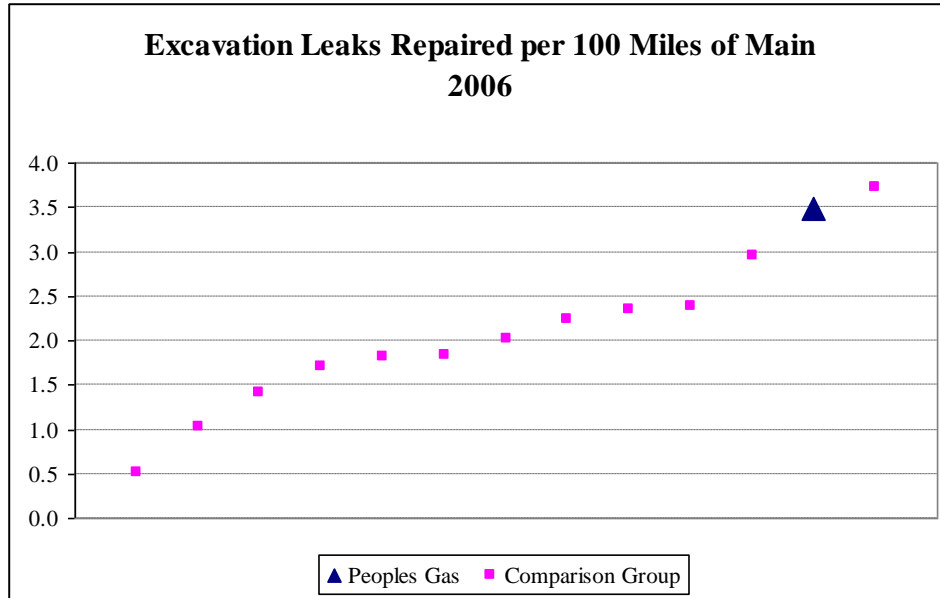
### 3. *Comparative Analysis*

In Section VI.B of this report, Comparative Analysis, Liberty presented a comparison of Peoples Gas to a group of peer utilities. Among those comparisons were main leaks caused by excavation damage and service line leaks caused by excavation damage. The charts that follow duplicate the graphs for those two measures for 2006.

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<sup>40</sup> Response to Data Request No. 37.

<sup>41</sup> Interviews during the weeks of July 16 and August 13.



Peoples Gas was one of the worst performers in the comparison group regarding leaks caused by excavation on mains, and about in the middle of the comparison group regarding leaks caused by excavation on services. Overall, this analysis, in conjunction with other findings on excavation damage prevention shows that Peoples Gas at minimum has considerable room for improvement in reducing leaks caused by excavation.

#### 4. Best Practices

The Common Ground Alliance (CGA) is a nonprofit organization dedicated to the promotion of shared responsibility and implementation of the “best practices” in damage prevention. The CGA created its list of best practices as an educational and reference tool. They were developed



through consensus-based discussions among stakeholders. The CGA “guide” contains a section that includes best practice statements with supporting descriptions and references in the following eight areas:

1. Planning and Design Practice Statements and Description
2. One-Call Center Practice Statements and Description
3. Locating and Marking Practice Statements and Description
4. Excavation Practice Statements and Description
5. Mapping Practice Statements and Description
6. Compliance Practice Statements and Description
7. Public Education and Awareness Practice Statements and Description
8. Reporting and Evaluation Practice Statements and Description.

At Liberty’s request, Peoples Gas reviewed the CGA list of best practices and stated that it had implemented the best practices in sections 4 and 5 above.<sup>42</sup> However, as identified in this report, Liberty noted problems in training and in mapping, the two areas Peoples stated it implemented best practices.

Another source of best practices is the Greater Chicago Damage Prevention Committee (GCDPC), made up of representatives from facility owners and operators, design firms, excavators, state and local governments, and others interested in the protection of underground facilities. It provides for an open forum for organizations to share ideas and solutions to reduce damages to underground facilities.<sup>43</sup> A GCDPC subcommittee is the Best Practices Program.

The GCDPC does not document its findings and actions in a formal manner like that done by the CGA. However, Peoples Gas provided examples of some of the work done by the GCDPC. For example, on September 27, 2007, the Best Practices Program subcommittee requested four contractors working in the City of Chicago to attend an educational round table discussion regarding their current excavating practices in the City of Chicago. This discussion was held with these excavators to ensure they were aware of the guidelines and rules for safe excavating and underground utility locating when excavating in the City of Chicago. A Peoples Gas representative attended.<sup>44</sup>

[REDACTED]

[REDACTED] This discussion was held because of the recent installation of [REDACTED] facilities that were deemed emergency [REDACTED]. This increase in the number of emergency [REDACTED] installations caused Peoples Gas to have difficulties in coordinating the relocation of gas facilities in advance of all this emergency [REDACTED] work.

<sup>42</sup> Response to Data Request #96.

<sup>43</sup> Response to Data Request #209.

<sup>44</sup> Response to Data Request #209.

While the Best Practices Program subcommittee appears to have value, that value is limited. For example, to the best of Peoples Gas' knowledge, the GCDPC has never attempted to ensure that CGA Best Practices were incorporated into DIGGER, nor has the GCDPC made any effort to keep track of those CGA best practices that have been incorporated.<sup>45</sup> When requested by Liberty's, Peoples Gas could not make a comparison of JULIE and DIGGER with regard to best practices and could not explain differences between the two.<sup>46</sup>

### 5. *Root Cause Analysis and Performance Measures*

A root cause analysis (RCA) is a method for finding and correcting the most important reasons for undesired outcomes or performance problems. RCA differs from typical troubleshooting and problem solving in that these efforts seek solutions to specific difficulties, whereas RCA attempts to determine the underlying issues. An RCA can help to seek out unnecessary constraints and inadequate controls. It can help to target corrective action efforts at the points of most advantage. A good RCA is essential in pointing change management efforts in the right direction and finding the core issues contributing to tough problems.

A "Root Cause" is one of the underlying events, conditions, or factors that created or allowed the undesired outcome. A root cause should be specific, something over which management has control, and something for which the analysts can generate effective recommendations.

Peoples Gas provides data to the Common Ground Alliance (CGA) on excavation damage incidents.<sup>47</sup> Those data indicate the damage cause, such as no notification of one-call center or insufficient marking. These are direct causes. Peoples Gas has not performed root cause analyses of excavation incidents.

Data collection and analysis is important in excavation-damage prevention programs to monitor and improve performance. In particular, it would enable Peoples Gas to identify causes of failures and conduct trend analysis with the aim of reducing damages. With accurate and comprehensive data, Peoples Gas should be able to analyze these data so it can determine what type of events caused the damages. Peoples Gas could then work with the stakeholders such as excavators, the one-call center, the public, and municipal employees to focus on areas that it needs to address in order to prevent damages. Peoples Gas could also use results to guide the overall program, tailor education programs, amend the law as necessary, and improve processes.

Metrics in common use in the industry include:<sup>48</sup>

- Damages per 1,000 locate tickets issued
- Damages per mile of facilities
- Ratio of ticket no-show<sup>49</sup> to total tickets received by the operator

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<sup>45</sup> Response to Data Request #210.

<sup>46</sup> Response to Data Request #211.

<sup>47</sup> Response to Data Request #150.

<sup>48</sup> Liberty understands that federal DOT is considering adding the first two items in this list to its annual reporting requirement (Form 7100).

<sup>49</sup> No-show is a failure of the locator to respond within the allotted time.

- Failure of notification center to accurately transmit tickets to the operator
- Damages by cause, facility type (mains, services), and responsible party. Cause categories to include:
  - Excavator's failure to call
  - Excavator's failure to provide accurate ticket (e.g., wrong address)
  - Operator's failure to mark
  - Operator's failure to mark accurately
  - Excavator's failure to wait required time for marking
  - Excavator's failure to protect marks
  - Excavator's failure to hand dig within tolerance zone
  - Excavator's failure to hand dig
  - Excavator's failure to properly support and protect facility
  - Others

Liberty reviewed the data Peoples Gas submitted to the CGA for the period January through September 2007 and compiled the following summary of cause factors.<sup>50</sup>

No notification made to the one call center	89
Wrong information provided to one call center	4
One call center error	1
Facility could not be found or located	1
Facility marking or location not sufficient	33
Facility was not located or marked	31
Incorrect facility records/maps	7
Deteriorated facility	1
Excavation practices not sufficient (other)	316
Failure to maintain clearance	38
Failure to maintain marks	6
Failure to use hand tools where required	61
Improper backfilling practices	6
Data Not Collected	26
Other	<u>14</u>
Total	634

Peoples Gas only uses this type of information when the Risk Management is seeking a claim for damages. Peoples Gas does not use it for any type of performance evaluation of individuals or of the program. However, the above list demonstrates that Peoples is collecting appropriate information but not using it to track and improve the program.

Liberty understands that Peoples Gas is not required to report damages to the distribution system to the ICC. The ICC requires that hits to transmission lines be reported to it, but has no similar requirement for hits to the distribution system.

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<sup>50</sup> Response to Data Request #150.

### **3. Conclusions**

#### **1. Peoples Gas' written program and procedure manual addressing excavation damage prevention is adequate.**

Peoples Gas' Damage Prevention Program is included in the Company's Operating and Maintenance (O&M) Plan, and meets the basic requirements of the applicable federal regulations. It also addresses all of the topics contained in 49CFR192.614 and includes participation in the State of Illinois and City of Chicago's one-call systems, JULIE and DIGGER, respectively.

#### **2. No senior level or lower level management person has oversight over or ownership of the excavation-damage prevention program. (Recommendation II-5)**

Peoples Gas operates the program out of each of the three district shops, with no corporate level coordinating or responsibility. This contributes to inconsistencies across the three shops, minimal visibility of the program at the corporate level, and a very weak program overall.

#### **3. Peoples Gas' list of contractors, which it obtains from DIGGER, is not complete. (Recommendation II-6)**

Liberty identified a number of contractors who were on the list of those who had been contacted because they had damaged Peoples system, but that were not on Peoples Gas' list of active excavators, which it obtains from and which is maintained by DIGGER. Peoples Gas needs to work with DIGGER to make sure all active contractors are on a master list for several reasons, including the need to send letters at least annually to remind them of the importance of damage prevention.

#### **4. DIGGER does not effectively screen out non-emergency locates called in as emergencies. (Recommendation II-7)**

At times, excavators call in jobs as emergency locates in order to get immediate markouts (within 2 hours), as opposed to the standard practice, which takes several days. DIGGER does not screen for bogus emergency calls and, unlike JULIE, has no provision for penalizing excavators who make such calls. This practice interferes with the performance of the program and, in addition to the inefficiencies created, interferes with the normal work load of the locators.

#### **5. Peoples Gas is not using safe and accurate locating and marking practices. (Recommendation II-8)**

Liberty's site visits and records review identified a number of deficient locating and marking practices, including mismarks, marks not visible, and markouts not completed within the required time. Peoples Gas' performance was poor in terms of both numbers and percentages of deficiencies identified.

**6. Peoples Gas' training for its locators does not meet minimum requirements.**  
(Recommendation II-8)

Peoples Gas requires its locators to have taken basic Operator Apprentice training as well as two days of classroom and on-the-job training before the initial locate. In contrast, NULCA's training program takes approximately 2 weeks to complete. Liberty's comparison between Peoples Gas' training materials and classroom sessions and NULCA's training standards demonstrates that Peoples Gas does not meet PHMSA minimum requirements or industry best practices.

**7. Peoples Gas' communications with and training for excavators is deficient.**  
(Recommendation II-9)

For the period January 2006 through September 2007, Peoples Gas' underground facilities were damaged in 1,452 incidents. Of that number, 632 incidents (44 percent) were excavations about which the one-call system was not notified. Liberty concluded that Peoples Gas' communications to excavators regarding excavation damage prevention have not been effective.

Municipal workers caused 564, or 39 percent of the 1,452 incidents in the period referenced above. The last documented training of City of Chicago employees was in April 2004. Liberty concluded that the training provided to city of Chicago employees regarding excavation damage prevention was woefully inadequate.

**8. Peoples Gas' communications with the general public is acceptable.**

Liberty found that Peoples Gas is active in public education and awareness efforts, using standard industry practice techniques. Peoples Gas communicates with its customers about natural gas use and safety, including excavation damage prevention, in several ways. It sends a monthly newsletter to customers, the new customer welcome kit includes a safety brochure, and bill inserts deal with topics like inside safety inspections. The web site PeoplesEnergy.com includes safety information and available home safety services.

**9. Peoples Gas does not identify and observe directional boring activities.**  
(Recommendation II-10)

Directional bores create additional hazards to underground facilities and require special treatment, including a Peoples Gas presence on-site during the boring operation. However, Peoples Gas' locators mark out the site and leave, with no special consideration given to a directional bore site. The mark-out ticket usually indicates a directional bore. Even if not on the ticket, an adequately trained markout person should be able to assess the intent to bore at the site.

**10. Peoples Gas' procedural requirement to inspect the site every time its facilities are exposed is unrealistic and the company does not comply with the procedure.** (Recommendation II-11)

Peoples Gas does not inspect most sites after excavation exposure, and in fact, this is an unrealistic and impractical requirement. Peoples Gas needs to perform a risk assessment and

develop criteria for which types of sites must be inspected and which will be inspected on a sample basis.

**11. Peoples Gas' procedures do not require its personnel to seal by means other than caulking cast iron joints exposed during excavation. (Recommendation II-12)**

Federal code requires that exposed cast iron joints subject to pressures 25 psig or less must be sealed by means other than caulking. That requirement is not included in Peoples Gas' procedures, and Liberty observed that Peoples employees are generally not aware of it. Peoples Gas needs to incorporate that requirement in its procedures and practices.

**12. A comparison of the results of its damage prevention program with a peer group indicates that Peoples Gas is one of the worst performers. (Recommendation II-15)**

A comparison of damages to mains and services with a peer group of 12 other gas distribution utilities demonstrates Peoples Gas was one of the worst performers in the comparison group with respect to leaks caused by excavation damage to mains, and about in the middle of the comparison group with respect to leaks caused by excavation damage to services.

**13. Peoples Gas' adoption of industry best practices in the area of damage prevention is very limited. (Recommendation II-13)**

Of the eight categories of best practices recommended by the Common Ground Alliance, Peoples Gas claimed to have implemented best practices in two. However, Liberty's examination revealed deficiencies in those areas, leading to the overall conclusion that Peoples Gas has not implemented industry best practices in its excavation damage prevention program. Furthermore, Peoples Gas does not appear to be deriving sufficient benefit from the limited number of best practices adopted by Greater Chicago Damage Prevention Committee's subcommittee on best practices.

**14. Peoples Gas does not perform root cause analyses as part of its damage prevention program. (Recommendation II-14)**

Root cause analysis is an important analytical tool, and the Common Ground Alliance recommends its use. It should be a part of any utility's damage prevention program. Peoples Gas does not compile and analyze data essential for such analysis, although it appears that the field documents do identify some direct cause data.

**15. Peoples Gas does not maintain, track, and use performance measures. (Recommendation II-15)**

There are a number of performance measures in common use in the industry, including damages per mile of mains, damages per 1,000 excavations, total number of hits, and many others. Peoples Gas does not maintain any such statistics. Furthermore, the ICC requires reporting of hits to transmission systems, but not distribution systems, and Peoples does not track hits to its distribution system.

## **4. Recommendations**

### **II-5 Designate a manager with overall responsibility for the excavation damage-prevention program.**

Peoples Gas should designate a senior executive within the company to have overall authority and responsibility for the excavating damage prevention program, including implementing the recommendations described herein and ensuring consistency among the districts and the related support services (*e.g.*, Technical Training). Peoples Gas should implement this recommendation within three months of the date of this report.

### **II-6 Work with DIGGER to develop and maintain a complete list of excavation contractors.**

Peoples Gas and DIGGER need to work together to develop a system for maintaining and updating a list of active contractors. The list should be updated in real time as either party becomes aware of new contractors and other excavators and Peoples Gas should use it for its annual or more frequent general communications with excavators. Peoples Gas should ensure that the new, complete list is available within three months of the date of this report.

### **II-7 Work with DIGGER to develop a program to screen out bogus emergency-locate requests.**

Peoples and DIGGER should develop a protocol to enable DIGGER to distinguish between bona fide emergency requests and bogus requests, and to institute penalties for excavators who abuse the emergency locate service. Peoples Gas should make every effort to establish the protocol and implement the notifications within three months of the date of this report. Within six months of the date of this report, Peoples Gas should report to the ICC regarding efforts to implement a penalty system for abuses of emergency locate requests.

### **II-8 Upgrade the training program for locators.**

As a group, Peoples Gas' locators need more and better training. Peoples Gas should design and implement the improved training program within six months of the date of this report. All locators should receive the new training within one year of the date of this report.

### **II-9 Develop and implement a communications and training protocol for the City of Chicago municipal workers and private contractors.**

Peoples Gas should develop and implement a program for meetings with municipal and private excavators to educate and train them about the damage prevention program. Excavators should be required to attend such meetings. Peoples Gas should implement this recommendation prior to May 2009.

**II-10 Develop and implement a procedure for monitoring directional boring activities.**

Peoples Gas should develop a procedure for identifying and monitoring directional boring activities and train its locators or other monitors in the specific requirements and hazards associated with directional bores. Peoples Gas should pay particular attention to those contractors who have caused damage in previous boring operations. Peoples Gas should have the new procedure in place within three months of the date of this report.

**II-11 Develop and implement criteria and a procedure for conducting inspections of excavating sites.**

Peoples Gas should develop criteria for inspecting excavation sites, including a determination and ranking of relative risk of various types of excavations and development of a realistic and achievable sampling protocol. Peoples Gas should implement the procedure within six months of the date of this report.

**II-12 Develop and implement a procedure for sealing exposed cast iron joints that are subject to pressures of 25 psig or less.**

Peoples Gas needs to include this code requirement in its procedures, make its field personnel aware of the requirement, and implement a process to provide for such sealing. This is a code requirement and Peoples Gas should implement it within 30 days of the date of this report.

**II-13 Review and implement Common Ground Alliance (CGA) best practices not in place.**

As part of the overall upgrading of the program discussed in this chapter, Peoples should review the CGA compilation of best practices, discuss them with the ICC, and determine which it should implement. Peoples Gas should complete the review and propose an implementation schedule to the ICC within six months of the date of this report.

**II-14 Develop and implement a root cause analysis program.**

As part of the previous recommendation regarding the general upgrade of its damage prevention program, Peoples Gas should supplement its existing data collection. It should incorporate the information from the DIRT root cause form into Peoples Gas' Form 7086, Report of Facility Damage. Using that data, it should develop and implement a root-cause analysis program. Peoples Gas should have the program in place within six months of the date of this report.

**II-15 Develop a system for tracking performance metrics for the damage prevention program.**

As part of its general upgrade of its damage prevention program, Peoples Gas should develop a system for collecting and tracking performance metrics, including a comparison with a peer group of utilities. Peoples Gas should accomplish this within one year of the date of this report.



The ICC may want to consider requiring Peoples Gas (and utilities under its jurisdiction) to report to it all damages or probable violations of the Illinois Underground Utility Facilities Damage Prevention Act using the DIRT “root causes.” This would enable the ICC to analyze damage prevention activities and step up enforcement in certain areas.

## **C. Corrosion Control**

### **1. Background and Objectives**

#### **a. Corrosion**

The control of all of the forms of corrosion, internal, external, stress corrosion cracking, and microbiologically induced corrosion (MIC) is a major safety program because of the large percentage of failures that corrosion causes. These failures typically lead to a release of natural gas (or in liquid pipelines, a hazardous liquid) that can affect public safety. A recent incident (December 2007) caused by external corrosion resulted in the death of a motorist in Louisiana when a pipeline ruptured under an interstate highway. Recent studies by U.S. Department of Transportation (USDOT) indicate that all forms of corrosion are either the first or the second largest cause for pipeline failures in the United States. A recent NACE (National Association of Corrosion Engineers) study estimated the total costs for corrosion to the United States infrastructure (which includes roadways and bridges besides metallic pipelines) at \$276 billion, of which \$7 billion is in the gas and liquid transmission pipelines.

Corrosion is an electro-chemical reaction in which the base metal is returning to its native state, which is typically a chemical anion with either oxygen or a salt cation.<sup>51</sup> The driving force of the reaction is to lower the state of energy in the environment and this can be accomplished by having the pure metal (to which energy was added to make it pure) give up electrons to the environment and combine chemically with oxygen (forming an oxide, or rust) or with salt cations to form a soluble metallic salt in the soil. This reaction can be eliminated by isolating the metal from the soil or by providing additional energy to overcome the natural tendency to return to the native state. The energy can be provided via electrons from the soil by having another more active substance to “corrode.” This is called a sacrificial anode, which is made from zinc or magnesium and provides electrons to the metal pipe. An impressed current electrode, typically iron, can give up electrons by impressing a direct current on them and making the pipe being protected negative.

Controlling external corrosion in metallic pipelines can be accomplished through a proactive corrosion control program. Such a program typically uses two methods to mitigate the effects of external corruptions. One method is to isolate the pipe or coat from an electrolytic environment, such as soils containing chemical ions, moisture, and oxygen. Such coatings have been mandated on buried pipelines since the enactment of pipeline safety standards in 1968, which became effective in late 1970. Many of the larger and proactive gas operators (both inter- and intrastate) started mandating coated pipe in the 1950s. The cathodic protection coating isolates the pipe

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<sup>51</sup> A negatively charged ion that has more electrons in its electron shells than it has protons in its nuclei is known as an anion. Conversely, a positively charged ion, which has fewer electrons than protons, is known as a cation.

from the soil environment electrically and thus breaks the corrosion cell before it has a chance to form. Since coating is not foolproof or 100 percent successful in stopping corrosion, the 1968 standards also mandated a second level of cathodic protection. This involves having either impressed current or sacrificial cathodic-protection currents applied to all pipelines constructed after 1970. Several operators had been installing cathodic protection as early as the 1950s in tandem with pipe coatings to protect their investment. A third level of protecting pipe against corrosion involves ensuring a “protected state” is achieved. Certain minimum standards were set and operators had to test their systems at a proscribed interval to measure the effectiveness of both the coating and cathodic protection currents achieving this protected state.

Internal corrosion control in metallic pipelines can be affected by coatings or treating, transporting, and delivering gas that is not corrosive. The typical components in natural gas, methane, higher molecular weight hydrocarbons, and small or trace amounts of carbon dioxide and sulfur compounds, typically by themselves do not form corrosive liquids or gases. However, when an electrolyte such as water or glycol (from a water reducing dehydration system) are present in sufficient quantities (over the gases dew point), then these liquids can form corrosive acids that are detrimental to the interior of the pipe. Most local distribution gas companies have not had major issues with internal corrosion provided they are not located near a storage field that does not have adequate dehydration facilities or receive sour gas supplies from local producing fields.

Stress corrosion cracking is not typically an issue for local distribution gas companies because one of the requirements is that the pipeline operates at high stress levels, typically in excess of 60 percent of the specified minimum yield strength (SMYS) of the pipe. Most LDCs in urban and suburban areas operate their pipelines at stress levels less than 50 percent of the SMYS for the pipe.

MIC can be a factor in both external and internal corrosion and mitigating the risk of MIC corrosion can require additional measures beyond normal cathodic protection practices. MIC is localized and testing for areas where MIC can occur can be easily accomplished. Operators can overcome MIC corrosion by additional cathodic protection currents for external corrosion and by pH adjustments or buffering for internal corrosion. Removal of the electrolyte can also eliminate MIC internal corrosion.

#### **b. Applicable Federal and State Codes**

The federal and state codes relating to corrosion control are in 49CFR192 Subpart I, which is made up of sections 192.451 to 192.491. These codes have been adopted in full by the Illinois Commerce Commission in their regulation section 590.10. Subpart I contains requirements for the design, maintenance, operation, and monitoring of corrosion control facilities installed since 1971 and the monitoring of those installed and operated prior to 1971. These regulations specify the monitoring intervals for both mains and services and typically require yearly testing on mains (except for short sections under 100’) and isolated services. Rectifiers, critical bonds, or current drains require testing six times per year. Short mains (under 100’) and isolated services must be tested every 10 years and atmospheric corrosion inspections are required on a 3-year interval.

When a section of cathodically protected service is out of compliance (either by a reading less negative than -0.85 VDC with a copper-copper sulfate reference cell or with less than a 100 mVDC shift upon polarization), prompt remedial action is required.<sup>52</sup> Per the ICC, prompt is defined as 12 months from when a non-compliant reading was taken. Under certain circumstances, additional time may be granted by the ICC for corrective action if such a delay was out of the control of the utility, *e.g.*, permits, roadwork.

### **c. Regulatory History**

Over the last several years, Peoples Gas has not met the minimum requirements for testing and repairing corrosion control systems on separately protected services and short segments. In 2006 the ICC cited Peoples Gas for failure to comply with §192.465 which states, in part:

*(a) Each pipeline that is under cathodic protection must be tested at least once each calendar year, but with intervals not exceeding 15 months, to determine whether the cathodic protection meets the requirements of §192.463. However, if tests at those intervals are impractical for separately protected short sections of mains or transmission line, not in excess of 100 feet (30 meters), or separately protected service line, these pipelines may be surveyed on a sampling basis. At least 10 percent of these protected structures, distributed over the entire system must be surveyed each calendar year, with a different 10 percent checked each subsequent year, so that the entire system is tested in each 10-year period.*

*(d) Each operator shall take prompt remedial action to correct any deficiencies indicated by the monitoring.*

These violations of the gas safety code had been noted in inspections and audits performed by the ICC staff in 2004 and 2005 on records obtained from Peoples Gas for inspections (cathodic protection readings) and corrective actions that took place in 2003, 2004, and 2005. In the later part of 2006, Peoples Gas and the ICC came to an agreement and as part of that agreement, Peoples Gas paid a fine and agreed to pay for an audit by an outside third party chosen by the ICC, and to correct any deficiencies in their corrosion control program.<sup>53</sup>

### **d. Objectives**

The objectives for the review reported in this chapter were to determine whether:

- Peoples Gas' corrosion control program employed modern technology and industry best practices.
- The corrosion control program met or exceeded the minimum requirements contained within the federal code.
- Corrosion control operating and maintenance procedures addressed code requirements and personnel followed the procedures.
- Corrosion control records were accurate and properly maintained.

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<sup>52</sup> NACE (National Association of Corrosion Engineers) SP 0169-2007 which has the values stated in §6.2.2.1.1 (-0.85 VDC) and §6.2.2.1.3, and 49 CFR 192.463.

<sup>53</sup> ICC Order No. 06-0311, ICC vs. Peoples Gas Light and Coke Company, December 20, 2006.

- Peoples Gas investigated and took appropriate actions for potential corrosion problems identified.

## 2. Findings and Analysis

### a. Employee Turnover and Organization

Turnover among Peoples Gas' corrosion control personnel has been very high; personnel in corrosion control are inexperienced in that area. This turnover is indicative of a program in trouble and one that does not have strong and consistent direction.

Since the beginning of this investigation, there have been three managers of corrosion and two individuals in the corrosion engineer position. At the start of the study, the corrosion control group reported to the manager of technical training. At the initial introduction meeting, Peoples Gas introduced a new manager from the Compliance Monitoring Group (CMG), but within a month that individual had been reassigned and Peoples Gas appointed a manager from special projects to corrosion control and other compliance and special projects. During this timeframe, a qualified corrosion engineer who supervised the corrosion technicians and essentially ran the program announced her resignation. As an interim measure, Peoples Gas assigned a supervisor from special projects to the corrosion engineer's position even though the individual did not have any corrosion control experience. An internal and external search for a corrosion engineer was not successful and the temporary individual was asked to stay on permanently. There are two senior corrosion technicians within the company, but they are assigned full time to pipeline integrity and do not participate in any corrosion work other than what relates to transmission pipelines.<sup>54</sup>

The classification of union personnel taking corrosion readings (and doing other mandated program work) were the Operation Apprentice (OAs), which is lowest union level in the company and were essentially individuals with no gas company experience. During the field audits observing the OAs, Liberty found that almost all had been on the job in corrosion control for less than a year and most have been promoted out of the position so they will not be taking readings next year. Thus, not only are these individuals minimally trained, but also any experience they gathered will be lost since they will not be doing this work the following year. Liberty observed this pattern in all three of Peoples Gas' shops or districts. Most of the OAs were happy about leaving since they will be getting a pay increase with their new positions. The operations group uses corrosion control readings as fill in work when other work is light and thus signals to the employees that this is not very important to the group and not an area that one can obtain promotion and pay increases. After several years, all OAs cannot get pay increases because they have reached their cap.<sup>55</sup>

A good OA will be promoted to another classification, and thus the taking corrosion control readings is a stepping stone for good employees and may be a dumping ground for poor employees. There were several employees that had many years as an OA and another employee

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<sup>54</sup> Discussion with Corrosion Manager over several visits in late 2007 and early 2008.

<sup>55</sup> Discussions with OAs in summer of 2007 when performing trailing audits.

mentioned that these OAs move from area to area and job to job because it is easy and the demands are small.

The general supervisors are one of the most senior groups of the field forces. These individuals typically have many years with the company and have been promoted up through the ranks. They have a good understanding of the Peoples Gas system and many have done many of the jobs they currently oversee. One exception to this is corrosion control because, up until recently, there was a separate corrosion group and that group handled all of the corrosion issues and readings. Since the mid 2000s this has been moved into the OA classification and now is supervised by the general supervisors.

When there is an issue or a corrosion problem, a general supervisor can call the corrosion group (a corrosion engineer and three non-union technicians) for assistance. There is a time delay between making the call and having a technician show up because the technicians must work in all three districts and their priority is determined by the corrosion engineer and not by the needs of each district. These delays do cause some irritation on the part of the general supervisors because they do not believe their individual concerns or priorities are given sufficient weight and thus they are not in control. With a 12-month window, there is not a great deal of urgency in getting cathodic jobs completed as quickly as possible and until recently Peoples Gas appeared to wait until the eleventh month before scheduling the job for upgrading or repair. Since the summer of 2007, Peoples Gas has been using a contractor to install anodes on all below code cathodic protection jobs. Because the contractor is paid based on the jobs completed, they are speeding up the completion of jobs so they can increase their short-term cash flow. Many jobs now have been completed in less than six months since the initial below code reading.

Several of the general supervisors discussed their collective lack of knowledge when it comes to corrosion control and asked if there were industry course available. One supervisor was shown how to calibrate reference cells and thought that this simple procedure would improve the accuracy of the corrosion readings at essentially no cost. The general supervisors are provided the same training as the OAs with no additional diagnostic or corrective action training or information.<sup>56</sup>

Recent changes to the management pension plan at Peoples Gas will probably result in an exodus of experienced general supervisors over the next five years. The pension plan for management employees will be phased out within five years, and 15 years for union employees. This will result in a major loss of knowledge for Peoples Gas. Turnover will only increase in the general supervisor category as the five-year window to the elimination of pensions nears closure.

## **b. Corrosion Control Field Performance**

### *1. Corrosion Readings*

Peoples Gas had a high rate of inaccurate corrosion control readings, both for routine testing and corrective action testing.

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<sup>56</sup> Interview with Training Center personnel, January 15, 2008.

The training the OAs receive is the bare minimum to take corrosion readings. They and their supervisors do not have sufficient training to determine what is wrong and to analyze corrosion readings.

Liberty sampled 48 routine readings. Using a criterion that a trailing reading within +/- 0.07 VDC<sup>57</sup> is acceptable, the following results were observed:

- Readings correct: 26
- Readings incorrect: 22
- Percentage incorrect: 46%

The incorrect readings included readings on insulators, which was the largest problem with OAs' readings. Frequently, the OAs did not take the reading on the proper side of the insulator, did not record on the proper side, or were unable to test or determine when an insulator may be shorted.

Liberty also sampled 55 readings taken during a trailing audit of corrective actions, again using the criterion that a trailing reading within +/- 0.07VDC is acceptable, and found the following:

- Readings correct: 24
- Readings incorrect: 31
- Percentage incorrect: 56%

Liberty sampled 14 rechecks of service readings that OAs reported between -0.85 and -0.90 VDC. Using a criterion that a trailing reading within +/- 0.07 VDC is acceptable, the following results were observed:<sup>58</sup>

- Readings correct: 3
- Readings incorrect: 11
- Percentage incorrect: 79%

Of the incorrect, most were worse than originally reported by the OA:

- 7 of 14 were much worse than what the OA reported
- 4 of 14 were much better than what the OA reported

Peoples Gas does not install test stations on separately protected services. Therefore, the OA must obtain most of the readings by pressing a metal bar on the shut off valve. In many cases, these locations may have dirt, rust, or other non-conductive or marginally conductive materials that make taking such reading consistently difficult because the amount of pressure applied to the metal bar can affect the reading (by not applying sufficient pressure an incorrectly high reading can be obtained).

Several of the Corrective Actions (CA) did not bring the service or main to acceptable levels of cathodic protection. Several others were borderline (per Peoples Gas, readings between -0.85 and -0.90 are considered borderline especially for 10-year interval services and mains and will

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<sup>57</sup> Many corrosion engineers (and regulators) use a level of +/- 0.050 VDC as similar to a previous reading, for this audit a slightly larger range was selected because of some of the issues with reading cathodic protection potentials on curbs, sidewalks and in a city environment. Contact resistance, i.e. how hard the pressure is placed on the reference cell can change a reading slightly,

<sup>58</sup> Initially these readings were reported using a range of +/- 0.050 V. Changing to the broader range used on subsequent trailing audits made no difference in the number or percentage out of range.

probably fail if properly read at the next cycle. The incorrect readings included one job with no reading, another job with more than 12 months between a down reading and the repair, and a high school with a down reading in August 2006, an unsuccessful Corrective Action performed in August of 2007, and not fixed and no due date for that repair.

## 2. *Corrective Actions*

Peoples Gas did not perform corrective actions in a timely fashion.

Peoples Gas did not initiate most of the CAs observed until 11 months after the down reading. If the action was not successful, these jobs could be considered violations of the 12-month repair rule if other immediate corrective action is not taken. Additionally, these unsuccessful CAs are now requiring multiple trips from both OAs and corrosion technicians. There should have been some concern having a service on a public high school not cathodically protected for almost 12 months. On another visit, Liberty observed testing at a hospital with a down service for many months. Buildings with many people that may be difficult to evacuate such as schools and hospitals should have corrective actions done promptly. Peoples Gas processed the CAs by date rather than using risk or consequences. Most urban gas companies give higher priority to buildings that could be difficult to evacuate and have large populations, especially publicly owned facilities and hospitals.

When a below code reading is registered, regardless of cause, Peoples Gas' mainframe computer automatically schedules to put an anode (either a 17# or 32# sacrificial magnesium anode depending on main size). Operations people stated this was the most cost effective method to address corrective actions and if the anode did not work they would then call in a corrosion technician to do diagnostic work. They also stated that having the OA's (Operations Apprentice) do anything other than taking a reading was not cost effective.<sup>59</sup>

This process is problematic from both a cost and corrosion control perspective. The process is that:

1. An OA takes an initial down reading;
2. A maintenance or contractor crew to install anode as corrective action;
3. An OA takes another reading to determine if the corrective action solved the problem.
4. If not, a corrosion technician goes out to do diagnostics and find the root cause;
5. A maintenance or contractor crew performs additional corrective action;
6. An OA takes another reading after the additional corrective action to determine if it worked.

Each of these steps not only increases costs, but if the initial corrective action was not performed promptly, then these additional actions could result in the corrective action not taking place in the mandated 12-month period and the main segment is with inadequate cathodic protection for an extended period of time.

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<sup>59</sup> Interview, Corrosion Control Manager and others, June 13, 2007.

### 3. *Atmospheric Corrosion and Bridge and Tunnel Inspections*

Liberty observed three Bridge and Tunnel inspections that the Central Shop personnel performed.<sup>60</sup> Peoples Gas' O&M requires quarterly Bridge and Tunnel inspections (even though both state and federal codes mandate 3-year inspections for exposed, atmospheric piping). The first site visited was a tunnel location on [REDACTED]. This site had a rectifier but the inspection team did not know if it protected the gas main in the tunnel and the crew had no equipment to verify if there was cathodic protection on the main in the tunnel (the tunnel had water and the main at the bottom was below the water level). The crew measured the distance to the water in the tunnel, checked for gas levels in the down leg, and used a flashlight to inspect for atmospheric corrosion on the down leg of the main and metal ladder on the side of the tunnel.

The second site was an overhead bridge [REDACTED]. This was a fairly new structure, and Liberty had to suggest to the crew that they pay particular attention to the soil-air interface when performing atmospheric corrosion inspections on bridges and other above ground structures. The crew also changed some burned out bulbs on the navigation lights on the bridge.

The last site visited was at the Chicago [REDACTED]. These facilities are supplied with gas from a main/service that exits a bridge abutment and is hung from an elevated section of city street. There are several services and one comes off the bridge and goes underground until coming up in a new sidewalk next to one of the printing plants. There was surface corrosion where the sidewalk concrete was touching the steel pipe, and Liberty pointed this out to the crew as a likely location for significant corrosion in the near future. Where the main/service exits the bridge abutment, there may be significant corrosion but it appears that this was the first time this line was traced to this location and from what the crew said, there never was an inspection of that location because it is just above some railroad tracks and getting permission to inspect it would have to be approved by the railroad. This line was installed in 2002 and thus at least two inspections have been missed.<sup>61</sup>

Based on some issues uncovered during the review of atmospheric inspections, Liberty requested the training records of all individuals that have passed the OQ certification for atmospheric corrosion, which is the exception of those individuals inspecting meter sets and related piping. The OQ regulations in §192.805 state that any maintenance activities that meet the four-part test must be included in such a program.<sup>62</sup> The records supplied by Peoples Gas state that the individuals performing atmospheric corrosion or Bridge and Tunnel inspections in Central Shops were qualified to do so.<sup>63</sup>

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<sup>60</sup> Liberty observed atmospheric inspections on May 8, 2008.

<sup>61</sup> Response to Data Request #231 and #232.

<sup>62</sup> §192.801(b): (1) Is performed on a pipeline facility; (2) Is an operations or maintenance task; (3) Is performed as a requirement of this part; and (4) Affects the operation or integrity of the pipeline

<sup>63</sup> Response to Data Request #253, training records for CCAD (corrosion control work in operations) and MPCII (taking corrosion readings in the field).



#### 4. *Casings*

Peoples Gas does not directly test casings for isolation from the carrier pipe.<sup>64</sup> Under §192.467, all “buried or submerged pipeline must be electrically isolated from other underground metallic structures, unless the pipeline and the other structures are electrically interconnected and cathodically protected as a single unit.” When asked about their casing testing procedures, Peoples Gas indicated it did not have any and did not know of any shorted casings on its system.<sup>65</sup> The Corrosion Manager thought that there were about 200 casings on the system and none were shorted. The code is not clear that testing must be made on each individual casing to prove it is isolated from the main. Because of this lack of clarity, many gas operators use yearly pipe testing to determine if a casing is shorted. The logic is if the casing is shorted, then the main traveling through the casing can have an acceptable cathodic protection reading and thus from inference the casing must be shorted to the main. To use this logic, there must be test stations adjacent to each casing that the operator can use to check that the main has a good cathodic protection reading. This is the logic that Peoples Gas uses, but there may not be a test station for the casing. The concern is not the lack of testing of casings but rather the poor track record of the OAs testing in general could cause a shorted casing to be overlooked and thus lead to a corrosion failure.

#### 5. *Communications*

Corrosion control does not interchange information with other areas of the company.

Peoples Gas operates in silos in that organizations do not appear to share data and some data that could be beneficial to making better decisions is either not available or not known to the decision makers. Corrosion /Leak Management is an example of the lack of sharing of information. Corrosion control has no knowledge of where leaks are occurring and leak management does not know where there are corrosion issues. The result is that in planning main replacements there is no coordination with areas that may have corrosion issues such as from stray current.

#### 6. *The Benito Juarez High School*

The gas service at the Benito Juarez High School on Ashland Avenue in Chicago provides an example of serious field performance issues on the part of Peoples Gas. These issues include the accuracy of corrosion readings, the timeliness and effectiveness of corrective actions, and the consideration given to locations with many occupants.

Peoples Gas installed the original protected steel service in 1978. The service came from a 20-inch cast iron main. In 2002, Peoples Gas replaced about 90 percent of the service with plastic after discovering a leak. A 3-foot section of steel connected the main to the new plastic service. Peoples Gas had installed an anode on this 3-foot section, but, in August 2006, testing showed that the anode did not provide the steel section with adequate cathodic protection. Peoples Gas

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<sup>64</sup> Interview, Corrosion Manager, May 7, 2008, and the lack of electrical isolation testing records.

<sup>65</sup> Interview, Peoples Gas Corrosion Manager, May 6, 2008.

again installed an anode, and in August 2007, Liberty witnessed additional testing, which once more showed the service to be below code requirements.

Following this testing, Peoples Gas obtained satisfactory test results. In September 2007, Liberty again visited the site and found that the corrosion reading was still below code requirements. The two readings Liberty obtained were nearly identical, making the intervening reading by Peoples Gas suspect.

In April 2008, Peoples Gas reported that it had replaced the 3-foot section of steel service pipe with plastic tied to the existing plastic service. An effective corrective action took 20 months, well above the 12-month timeframe required for corrective action even without consideration that Peoples Gas should have considered the high school a potentially high consequence location.

A review of the history on this service shows that the initial installation was probably improper, and that the service was in contact with and shorted to the cast iron main. Peoples Gas took the corrective actions of installing anodes in 1994, 2002 and several times in 2007. In addition, Liberty believes that the good readings obtained over the years were probably directly over a new anode and as such give a false good reading on steel services and mains. Such a reading could result in a service or main having a corrosion leak even though protection appeared to be adequate. This is exactly what occurred on this service in 2002.

#### 7. *Stray Current*

Stray current is a problem for all urban utilities that are close to electrified railroads or transit systems that use DC electricity. Most of these entities are publicly owned and thus do not have to provide any mitigation to their influence on underground pipelines. Stray current influences are not only present for gas utilities but also can effect electric and water facilities.

Although stray currents are a problem in the Peoples Gas service territory, besides taking high and low readings on segments affected by these currents, Liberty did not see any other special testing. Peoples Gas informed Liberty that it hired a consultant to assist Peoples Gas. Peoples Gas claims to use several measures to reduce the influence of stray currents on existing segments. These are 1) it installs rectifiers to “over power” the stray current influences, 2) it replaces selective segments with plastic, which is not influenced by stray currents, and 3) it further sectionalizes stray current segments to reduce the consequences. All three of these methods are acceptable measures to reduce stray current influences. Another method that Peoples Gas uses to reduce the consequences of stray currents is to install a one-way bond, also known as a drain switch, to drain current from the gas main and direct it back to its source. This method does not eliminate the stray current but negates the negative consequences.

#### **c. Training of OAs (Operations Apprentices)**

The OAs corrosion training observed in January 2008 covered all of the basics and the instructor was very knowledgeable and offered to answer all questions. He emphasized that readings should not be taken over an anode and that the lowest reading is the best since it shows the worst case. He also fully described how to take readings at insulators, how to check if the wire was connected to the main and how to tell if an insulator is shorted using the resistance function in

the voltmeter. In the flower box test and qualification setup, one of the wires is off the main and students are expected to determine this and then use the connected wire.

The training given the Operations Apprentices (OA) is only sufficient for them to take readings but does not impart any understanding on why the readings must be taken and methods to ensure that accurate readings are taken. Any reading or test station configuration out of the ordinary can lead to errors in the readings.

During some of the field audits, Liberty found readings taken at test stations with problems such as the wires off the main and readings over the anode. The training noted these issues but the OAs were not using the training in their work. Such issues indicate that the training that the OAs received was not effective or sufficient for them in the field when it came time to take the readings. These problems may be a result of the time between passing the training class and when the actual readings are taken. These OAs may not use their training or refresher training for many months after it was given and may have forgotten some of the basics. It is also possible that the training material was revised based on observations from previous years or during the audit.<sup>66</sup>

OAs do not know what type of main or service they are testing and do not know if they are testing over an anode, which would give them a false better reading. Part 192 requires that operators take the IR (Internal Resistance) drop into account for getting accurate readings and they should not be taking readings over anodes.

The general supervisors who supervise the OAs do not receive any additional training. Thus if there are questions, concerns, or problems that the OA cannot handle, his or her supervisor cannot help unless it is about past company practices that they have performed in their careers. Several of the general supervisors asked about additional training and how other utilities do corrosion work. As a group, they seemed interested and concerned but stated that it appeared to them that the company just wants to get readings completed as quickly and cheaply as possible.

The first line supervisors and many of the OAs want to learn more, but they are given the one-week course and that is all since this is not looked upon as a career but rather just a duty that must be done. Sending the supervisors to a short course on corrosion may have many benefits and significantly improve the program. There are several of these courses given in the U.S. They are not very expensive and one of the courses is geared to gas companies and their needs.

Liberty witnessed the re-qualification training of OAs on corrosion control.<sup>67</sup> The training observed instructed the OAs not to take readings over anodes, how to determine if a test wire was separated from the main, how to properly make contact with a valve to test a service, and how to read insulators. There also was a very ingenious practical test using a short section of buried 2" pipe and various services in a flower box like structure. One of the test wires was

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<sup>66</sup> During a conversation with the trainer on January 15, 2008, he stated that the 2008 training on filling out the CP forms in the computer was emphasized based on feedback from the general supervisors and that was the major change in training from the prior refresher training.

<sup>67</sup> Liberty witnessed OA training on MPC I on January 15, 2008.

separated from the pipe and the students were graded if they could determine this and what they needed to do. Again, Liberty observed that this training did not carry over into field practice. During observations in the field in July and August 2007, Liberty observed that OAs were not attempting to take readings outside of the influence of the anodes (they had no idea where the anodes were placed). In addition, during the trailing reading part of the audit,<sup>68</sup> Liberty discovered numerous issues with incorrect readings on insulator joints, dead wires, and other issues.

#### **d. Records Audit**

Peoples Gas' corrosion records are not kept in a way that permits ready access. The Navigate system is not always up to date and is missing all corrosion history prior to 2005. Individuals have to use mainframe programs and move between Navigate and GMOS (a gas main legacy program on the mainframe) and DMIS (a service pipe legacy program on the mainframe) to figure out what happened on mains and services prior to 2005. On a CA (corrective action), there is no record of what was done. The situation would make it almost impossible for most people to research a job or an issue.

Liberty performed a record review covering both regular readings and specialized readings for rectifiers and bonds. Peoples Gas has both bi-monthly and annual bonds. The main difference is that the annual bonds have a near constant drain of less than 2 amps while the bi-monthly are over 2 amps and vary with time of day and day of the week. All of the recent readings from bonds were reviewed and there were several that had issues, *e.g.*, the bonds were not working correctly or there were no readings. On rectifiers, all of which must be read bi-monthly, a sample was reviewed, and again there appear to be similar issues with maintenance and readings. A follow-up by the corrosion manager regarding rectifier and critical bond readings found that most of the discrepancies were the result of either incomplete paper work (such as a missing installation date) or that the section was on a list for further diagnostic testing or evaluation (beyond the 12-month window for a CA).

Liberty's audit of corrosion control records identified several problems. The Peoples Gas O&M manual requires that all openings of steel mains be inspected for external corrosion, but there were no reports or documentation of such inspections.<sup>69</sup> Peoples Gas claims they do the inspection, but without documentation it is impossible to verify that this is done and if it is done properly.

During the records audit, a general supervisor and district manager stated that the maintenance ticket is the record used to document pipe and coating condition. This ticket is also sent to engineering whenever the pipe condition is rated as poor so that the main can be added to the

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<sup>68</sup> "Trailing readings" are those taken a short time after the scheduled reading to verify the reading accuracy.

<sup>69</sup> Response to Data Request #131, exposed pipe report is on maintenance ticket. There is no report available to the corrosion group and the information is not available unless a paper record of the maintenance ticket is reviewed or copied.

MRI (Main Replacement Index) for future replacement.<sup>70</sup> However, neither special projects nor corrosion were aware that this is where pipe condition reports reside.<sup>71</sup>

**e. Storage of Coated Pipe**

Peoples Gas' O&M manual requires that it not store fusion bonded epoxy (FBE) coated steel pipe in direct sunlight for more than two years. Liberty inspected the storage facilities for coated steel pipe and found that Peoples Gas does not track how long FBE coated steel pipe is exposed to direct sunlight. Liberty observed several sticks of pipe exposed for so long that the coating dates painted on the surface had bleached off and there was no way to determine when the pipe had been placed in storage or when it was coated.

**f. Industry Practices and Best Practices**

Peoples Gas is one of the largest urban local gas distribution (LDC) companies in the U.S. As such, it should be in the quartile of gas companies using the latest and the most sophisticated technology to operate and maintain their gas systems. Several other large urban LDCs have joined forces through approved industry groups to move technology forward and to validate some best practices. By participating in the American Gas Association (AGA) Corrosion Control Committee, Peoples Gas had access to most of the leading edge developments in operating and maintaining an LDC. Since this information was available to Peoples Gas, Liberty expected that Peoples Gas would implement leading edge technology in its corrosion control program.

Because of Peoples Gas' concern with confidentiality of the AGA Best Practices, Liberty was not able to view what best practices Peoples Gas has implemented.<sup>72</sup> Liberty's auditor has experience with several other gas distribution utilities with regard to corrosion control. Some of these best practices include using more technical personnel to take readings and perform diagnostic and potential simple corrective actions when the initial out-of-compliance reading was taken.<sup>73</sup> Other best practices that may have been discussed with AGA are looking at long-term trends in cathodic protection and setting targets or thresholds that once met automatically can trigger cathodic protection diagnostic work even when the segment or service is still protected. Such trend analysis would prevent segments or services from losing cathodic protection before corrective actions are taken.

A sign of an exceptionally good corrosion control program is that it is proactive and addresses issues before they become problems or are considered requirements under state and federal regulations. Some of the best companies set a change in current requirements, change in rectifier settings, or change in cathodic protection readings from the previous reading to the current reading (even if they are well within acceptable ranges) as a decision point to start diagnostic testing to determine what has changed and what can be done improve the reading to its "old" one. One company used a 20 percent change and had their computer flag a section that

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<sup>70</sup> Interview, Central District Manager and General Supervisor, January 16, 2008.

<sup>71</sup> Response to Data Request #131 with regard to exposed pipe reports which reside in operations but corrosion had no knowledge of.

<sup>72</sup> Response to Data Request #148.

<sup>73</sup> The Liberty auditor attended AGA Corrosion Best Practices in late 1990s.

experienced this regardless of the reading. This company had never had a corrosion leak on a protected main since records were kept. By taking a proactive approach, the company was able to maintain its protected steel system without large maintenance expenditures and without having many jobs falling under protection with regard to the regulations.

Liberty did not identify any industry best practices that Peoples Gas implemented with respect to corrosion control.

### **3. Conclusions**

**1. Turnover among Peoples Gas' corrosion control personnel has been very high; personnel in corrosion control are inexperienced in that area.**  
(Recommendation II-16.)

During the course of Liberty's investigation, there were three managers in charge of corrosion control and two people in the important position of corrosion engineer. The people now in these positions did not have prior corrosion control experience. There is a high turnover among the OAs who take corrosion readings because the position is not one that permits advancement. General Supervisors, while experienced with the company, had no special corrosion control experience or training. Changes in the Peoples Gas pension plan may result in the loss of those who do have related experience.

**2. Peoples Gas' corrosion control readings were inaccurate.** (Recommendations II-16 and II-17.)

Liberty performed various checks of Peoples Gas' corrosion control readings and found that the inaccurate readings ranged from 46 percent to 79 percent of the total readings taken.

**3. Peoples Gas did not perform corrective actions in a timely fashion.**  
(Recommendation II-18.)

Peoples Gas did not typically schedule corrective actions for work until 11 months after the down corrosion reading. The procedure automatically called for an anode installation, which may or may not be an effective solution. Peoples Gas did not prioritize corrective actions on the basis of the type of facility affected. Effective corrective actions could and did exceed the 12-month window for required repairs.

**4. There were problems with Peoples Gas' atmospheric corrosion inspections.**  
(Recommendation II-19.)

Peoples Gas' O&M manual requires quarterly bridge and tunnel inspections. However, an inspection crew was not familiar with inspection sites and did not have required operator qualifications to perform the inspections.

**5. It is not clear that Peoples Gas completely tests for electrical isolation of casings.** (Recommendation II-20.)

Peoples Gas does not perform tests to specifically determine if casings are electrically isolated from the carrier pipe per §192.467. It uses annual pipe test data to determine if there is a shorted condition. This is a common practice and typically, a down reading on the carrier pipe indicates an electrical contact between the carrier pipe and the casing. Although the code is not clear that special electrical isolation tests must be performed, the low level of accuracy of annual corrosion testing at Peoples Gas raises the concern that there may shorted casings that, if not addressed, could lead to future leaks and failures. Peoples Gas does not believe it has any shorted casings, although Liberty has not seen any basis for that belief.

**6. Corrosion control does not interchange information with other areas of the company.** (Recommendation II-21.)

An example is that corrosion control and leak management do not share information, so corrosion control has no knowledge of where leaks are occurring and leak management does not know where there are corrosion issues.

**7. Training given to those taking corrosion readings and their supervisors did not effectively transfer to the field.** (Recommendation II-22.)

Liberty observed training and found it to be thorough and well presented. However, the field observations showed that mistakes were made on matters specifically covered by the training.

**8. Peoples Gas' corrosion control record keeping is inadequate and deficient.** (Recommendation II-23)

The systems used to keep corrosion records are not user friendly and are not all up to date. It is impossible or at least very difficult to investigate or research an issue using the current method of record keeping.

**9. Peoples Gas did not comply with its own requirements for the storage of coated pipe.** (Recommendation II-24.)

The Peoples Gas O & M Manual specifies that all fusion bonded epoxy coated pipe will be either used within two years of receipt or removed from direct sunlight to protect the coating.

**10. Peoples Gas has not implemented industry best practices with respect to corrosion control.** (Recommendation II-25.)

Liberty did not identify any industry best practices that Peoples Gas implemented with respect to corrosion control. Peoples Gas could not identify any such practices implemented.

## **4. Recommendations**

### **II-16 Bring experience and stability to the corrosion control organization.**

Peoples Gas should regard its buried gas pipes as valuable assets to be protected from decay and damage. In this regard, Peoples Gas should upgrade the experience and knowledge of the personnel taking the cathodic protection readings. These people are currently the lowest paid and lowest skilled level of employees at Peoples Gas and are frequently moved and promoted out of this classification or assignment. Because their tenure is limited and this classification is considered a “dead end,” there is little or no incentive to do much beyond the barely acceptable and wait until they are either rotated out or promoted.

The Peoples Gas corrosion control program needs to be staffed with individuals who are dedicated to corrosion control. All corrosion control personnel need to have completed either specialized training or have experience in the corrosion control field. The Peoples Gas corrosion control program should have experienced leadership. The corrosion control program should have an executive champion who provides sufficient leadership to ensure success and to overcome obstacles from other organizations.

Peoples Gas should have made significant progress on this most important recommendation within one year of the date of this report.

### **II-17 Improve the accuracy of corrosion control readings.**

If OAs are to take readings at insulators, then Peoples Gas should improve their training so that they are able to determine which side of the insulator they are reading and, if the readings are the same, they will suspect that either there is a shorted insulator or they are reading the same side.

Peoples Gas should install test stations on cathodically protected services whenever work is performed on such services, such as installing an anode or repairing a buried service valve. This will provide Peoples Gas with a more consistent and true reading of the cathodic potential and the status of the service. All future steel services should be installed with either a test station or a means to take corrosion readings without using a bar on the service valve.

An independent organization, like the Compliance Monitoring Group, should monitor the accuracy of corrosion control readings. Peoples Gas should establish goals and metrics to monitor those goals regarding the accuracy of the readings.

Peoples Gas should be able to demonstrate significant progress on the implementation of this recommendation within six months of the date of this report.

### **II-18 Improve the methods and timeliness of corrective actions.**

The Peoples Gas method of performing corrective actions on corrosion control problems is slow and cumbersome at best and ineffective and wasteful at worst. Peoples Gas should re-evaluate its automatic corrective action response of putting an anode on each service or main that has a low reading and possibly consider doing diagnostic testing.



Troubleshooting corrosion control problems needs to be handled by individuals and not scheduled by a computer with a “one response fits all” solution. Corrosion control problems need to be anticipated in a proactive mode rather than addressed in a reactive mode only after compliance is missed.

Peoples Gas should develop a listing of buildings of public assembly (*e.g.*, hospitals, schools, day care centers, senior centers, churches) that have services that could fail and cause a gas release. Corrective actions for these facilities should receive priority scheduling. Peoples Gas needs to anticipate that these high consequence buildings may need additional testing and increased surveillance so as to either reduce the likelihood of a gas release or minimize the consequences.

Peoples Gas should implement this recommendation within six months of the date of this report.

#### **II-19 Evaluate atmospheric corrosion inspection practices.**

Peoples Gas must re-evaluate its atmospheric and Bridge and Tunnel inspections to ensure that all areas are properly inspected. Air-ground interfaces are particularly prone to corrosion. In addition, Peoples Gas should include an improved engineering standard for specifying how this interface is to be protected from corrosion and improve the training of personnel performing atmospheric and Bridge and Tunnel inspections so that they are aware of the critical nature of the air-soil (or water for tunnels) interface.

Peoples Gas should retrain its personnel doing atmospheric and Bridge and Tunnel inspections within six months of the date of this report. Additionally, all atmospheric and Bridge and Tunnel inspections should be re-performed within three months of the retraining. Within nine months of the date of this report, new engineering standards for handling the air-ground interface should be available for future installations and for retrofitting of existing locations.

#### **II-20 Test casings to ensure electrical isolation from the carrier pipe.**

Peoples Gas should ensure that all of its casings are electrically isolated from the carrier pipe. Peoples Gas should give the responsibility to corrosion technicians to test all of the casings in Peoples Gas system to ensure that they are electrically isolated from the carrier pipe as required by the code.

Peoples Gas should implement this recommendation within three months of the date of this report and perform all the necessary corrective actions within nine months of the date of this report.

#### **II-21 Improve organizational communications.**

The corrosion control group within Peoples Gas needs to be integrated within the Peoples Gas organization so that information flows freely and decisions are made with all of the facts with regard to corrosion (*e.g.*, leaks, main and service replacements, pipe storage).

Peoples Gas should implement this recommendation within six months of the date of this report.

## **II-22 Improve corrosion control training.**

Peoples Gas' training did not transfer to actions in the field. Peoples Gas needs to make changes to the content, delivery, frequency, or methods of training to overcome this fault. Peoples Gas should monitor field activities to feed back to training for improvements. Continual training of corrosion control personnel needs to be undertaken. A method to determine the effectiveness of the training is through the performance of trailing audits on corrosion readings conducted within 4 weeks of the original reading. Significant differences between the two sets of readings could reflect on the effectiveness of training.

Peoples Gas should implement revised corrosion control training and implement trailing audits within six months of the date of this report. Feedback from the audits to training should be continuous.

## **II-23 Improve corrosion control record keeping.**

The Peoples Gas corrosion control program must be given tools with which it can perform its function. These tools include computer programs to track and measure performance, equipment to perform its duties, and training to improve the caliber and knowledge base of its members. The records that Peoples Gas uses for corrosion control are disjointed and not functional with regard to determining what corrective actions have been performed, and where they are performed and need to be improved. The record keeping quality of the corrosion control is significantly below what is expected of an urban utility with over 500,000 customers.

Peoples Gas needs to investigate whether a new dedicated corrosion control database computer system can be installed to track, record, and notify corrosion control personnel when readings are overdue, when segments are near falling below code-mandated readings, and to track corrective actions. Such a new system must have the history of each segment loaded so that there is historic data that can be used to track current conditions. Peoples Gas should immediately start the investigation and should have a new system on line within 18 months of the date of this report.

## **II-24 Improve pipe storage practices.**

Peoples Gas should remove and scrap or recoat all of the FBE coated pipe in the pipe yard that is older than two years. If it cannot be determined what date the pipe was received, then that pipe must also be recoated or scrapped.

Within three months of the date of this report, Peoples Gas should start logging in all FBE coated pipe and placing it under a tarp or paint it with white latex paint prior to being stored in sunlight.

## **II-25 Demonstrate implementation of best practices.**

Peoples Gas should provide demonstrable evidence to the ICC that it has implemented AGA best practices with regard to corrosion control or provide convincing argument of why it should not implement certain of these practices. Peoples Gas should complete this recommendation within six months of the date of this report.

## III. System Operation

### A. Pressures, Valves, Regulators, and Odorization

#### 1. Background and Objectives

The Code of Federal Regulations 49CFR192 contains requirements for distribution line valves, vaults, pressure-relief and pressure-limiting devices, and odorization. Subpart D contains design requirements (192.181 to 192.189, 192.195, 192.199-192.201), Subpart L contains operations requirements (192.619-623), Subpart M contains maintenance requirements (192.739-192.743, 192.747-192.749), and Subpart L contains odorization requirements (192.625).

The Illinois Commerce Commission (ICC) fully adopted these code requirements in its regulation section 590.10 as minimum safety standards for the transportation of gas and for gas pipeline facilities. In addition, the ICC, in its Standards of Service for Gas Utilities, Part 500, adopted requirements for Monitoring System Pressures (ICC §500.270) and for Odorization of Gas (ICC §500.300).

ICC §500.270, Pressure Surveys, requires that:

- a. Each utility shall make pressure surveys at such intervals and of such comprehensiveness as may be necessary to keep itself fully informed regarding the character of the service being furnished from its system.
- b. All charts and readings taken in pressure surveys shall be preserved and filed in a systematic manner, accompanied by such information as may be required to show the date, hour and place of the test, the instrument used, and the name of the person making the test.
- c. For use in making pressure surveys, each utility shall provide one or more portable graphic recording pressure gauges and shall make frequent measurements of the gas pressure and of the pressure variation throughout the system.
- d. Each utility shall install and maintain recording pressure gauges on its system to indicate the adequacy of pressure control.

ICC §500.300, Odorization of Gas, requires that:

- a. Any gas not having a natural odor to serve as a warning agent in the event of the escape of such gas unburned, shall be artificially odorized in a manner satisfactory to the Commission before its introduction into any local distribution system.
- b. Attention is invited to the provisions of “An Act requiring the use of odor producing liquids in conjunction with the supplying of natural gas to certain buildings” (Ill. Rev. Stat. 1981, ch. 111½, par. 3601), which reads as follows:  
*“Section 1. No person, firm or corporation shall furnish or supply any natural gas to any school or public building unless an odor producing liquid is injected into the gas mains before the gas enters the premises of such school or public building, so that a strong odor will be noticeable whenever a leakage of such natural gas exists.”*

Peoples Gas receives high-pressure natural gas from interstate pipelines at four gate stations located near the city limits of Chicago. The gate stations meter the gas and reduce the pressure for delivery into the interstation high-pressure system, which delivers the gas into the medium- and low-pressure systems. The interstation system receives gas at approximately 150 psig and delivers gas through 22 medium-pressure regulator stations, which reduce the pressure to a range of 18-22 psig. Most of these stations consist of a monitor regulator operating in the passive wide-open mode with a working downstream regulator.

The medium pressure system supplies gas directly to customers as well as to 345 low-pressure district regulator stations that further reduce the gas pressure to approximately ¼ psig (7" water column) for use with home appliances.<sup>74</sup>

Peoples identified and inspects 4,011 critical network "N" valves, which include the first valve off a main or headers, emergency operations valves, and upstream and downstream valves on the 375 regulator stations.

Gas Operations Section (GOS) personnel ensure that station regulators and critical valves are working properly and that maximum safe pressures are not exceeded via inspections and "charting." They inspect for the presence of water, natural gas, hazardous and noxious gases, and parts in need of replacement. GOS personnel also shut down and control system pressures to enable Distribution Department personnel to perform maintenance work at safe operating pressures. GOS performs most of its work in confined spaces on regulators, valves, and vaults in accordance with Operating and Maintenance Plan Exhibit XII Chapter 2 Stations, Section 3 MP Stations, Exhibit XII Chapter 3 Regulators, Section 2 Regulator Inspection and Charting.<sup>75</sup>

In 2002, following an incident that occurred on February 26, 2002, in which a third-party contractor damaged a gas main, the ICC recommended that Peoples Gas conduct an internal study to determine the need for critical valves. The incident had created an outage affecting 4,454 gas customers. Peoples Gas' analysis (using the Advantica/Stoner pressure-modeling software program) involved identifying all 12" and larger gas main segments (a segment is a section of gas main that could be isolated between valves) and determining the number of customers that could experience a disruption in gas service if that segment were isolated on a 20 degree (Fahrenheit) day. Peoples Gas identified and ranked 1,116 segments. The analysis determined there were 16 segments that, if faulted, had a potential of creating an outage of more than 2,400 customers. Additional analysis of the 16 segments revealed that 10 either required record clean-up in Advantica/Stoner (valve configuration drawn incorrectly) or were low pressure segments, in which the segment could easily be isolated. Of the 6 segments that required physical improvements, 4 were in close geographical proximity. Peoples installed additional valve clusters, or made system modifications to reduce the number of customers affected by these segments to less than 10 customers each.<sup>76</sup>

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<sup>74</sup> 1 psig is approximately equal to 28" of water column.

<sup>75</sup> Response to Data Request #2.

<sup>76</sup> Responses to Data Requests #105 and #106, and Interview May 15, 2008, Distribution Design Group.

The objectives of Liberty's investigation reported in this section were to evaluate Peoples Gas' methods of providing odorized gas at safe and adequate pressures and to isolate the gas system in event of emergencies. The evaluated Peoples Gas' activities included:

- Inspect and evaluate abnormal operating pressure regulators and the condition of its regulator vaults
- Determine the need and location of system critical valves for emergency isolation and shutdown
- Inspect and verify the operability of those valves
- Odorize gas
  - Train and qualify personnel to perform the above tasks.

## 2. Findings and Analysis

### a. Regulator and Vault Inspections

Peoples Gas uses chartless electronic recorders installed inside vaults to compile input pressure, output pressure, case temperature, and battery voltage. The electronic recorders replaced the older pressure recording charts.<sup>77</sup>

Peoples Gas recently converted its pressure-recording charts in regulator vaults to electronic data recorders. This streamlined pressure verification activities. However, Liberty's inspection identified problems (downloading data from the chartless recorders) with the computer hardware and software interface.<sup>78</sup> A follow-up inspection determined that Peoples was still experiencing problems associated with data from the recorders being unable to be plotted in output report formats. The data download problems were for:

- [REDACTED]
- [REDACTED]
- [REDACTED]

The Gas Operations Section (GOS) maintains pressure-regulator inspection records on aging computer equipment. This equipment appears in need of replacement and upgrade and presents an immediate problem should the old computer equipment break down because it may be difficult to find parts.

To improve pressure control at its regulator stations, Peoples Gas has been replacing or retiring its older Reynolds, and Fisher and Donkin regulators and replacing them with Mooney regulators that provide superior performance and improved maintenance of system parameters. The table that follows shows the number of such replacements.<sup>79</sup>

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<sup>77</sup> Response to Data Request #118, and Inspection conducted November 15, 2007.

<sup>78</sup> Inspections Gas Operations Section November 15, 2007, and May 14, 2008.

<sup>79</sup> Response to Data Request #254, and Inspections Gas Operations Section November 15, 2007, and May 14, 2008.

Year	# of Fisher and Donkin Regulators replaced or retired	# of Reynolds Regulators replaced or retired
2002	7	4
2003	2	7
2004	1	5
2005	0	0
2006	6	7
2007	5	7

As of the beginning of 2008, Peoples Gas had 126 Reynolds control regulators and 124 Reynolds monitor regulators.<sup>80</sup>

**b. Placement of Critical Valves**

Peoples Gas identifies its critical valves needed for emergency isolation and shutdown of sections of its system, and inspects these valves for accessibility and operability.<sup>81</sup> The Engineering Department identifies “A,” “N,” “D,” and “T” valves.<sup>82</sup> District shop and GOS personnel identify non-emergency “C” valves. Shop Managers, the Gas Operations Section Supervisor, and the Manager of Distribution Design can make changes to the designations. Peoples Gas’ guidelines for spacing are:

- Spacing between Distribution valves are generally ½ mile on frontage mains, dependant upon service pipe density, affecting no more than 150 customers.
- Spacing between Distribution valves in header mains (6” and larger) supplying frontage mains, is ½ mile and is augmented when more than 500 customers would be shut down on non-peak days.
- Spacing between Network valves along interstation high-pressure main segments is a maximum distance of 5 miles. All medium pressure vault installations and large customer service connections are to have a full valve cluster to permit a two-way supply. Interconnecting mains are valved at the tie-in connection. In no case should any segment to be isolated in the interstation main system cause significant loss of pressure to the medium pressure main system.

Peoples Gas’ critical valves sectionalizing criteria appears to be fully adequate. For its system overall, Peoples applies acceptable criteria for emergency sectionalizing valve design.

**c. Valve Inspections**

Peoples Gas currently has 12,994 active valves on its gas distribution system. The number of valves changes with changes to the medium pressure system and as it installs or retires regulator

<sup>80</sup> Response to Data Request #143.

<sup>81</sup> Response to Data Request #103, valve design guidelines.

<sup>82</sup> A – O’Hare Airport, N – Network, D – Distribution, T – Temporary, C – Convenience

stations. Peoples Gas indicated that the company annually inspects 10,815 of these valves. The table below shows the categories of valves and frequency of required inspection.<sup>83</sup>

Valve Designation	Description	Count	Inspection Frequency
A	O'Hare Airport	135	Annual
C	Convenience	765	Not Inspected
D	Distribution	6,572	Annual
L	Low Pressure	126	Annual (loop valves)
N	Network	3,841	Annual
O	Regulating Station	141	Annual
T	Temporary	1,414	Not Inspected
	Total Valves	12,994	

GOS personnel conduct over 4,000 annual valve inspections (located on “main” lines or on feeder lines) for field identification, accessibility, and operability. Distribution field crews perform the remaining 6,000 valve inspections. GOS also annually inspects 113 Security Valves (slam shut) conducting a maintenance diagnostic test, 39 remote-operated valves (ROVs), and 13 Meter Runs.<sup>84</sup>

To accomplish this work in 1999, GOS had 34 employees (Manager, General Supervisor, Engineer, Technician, 6 Supervisors and 24 union personnel). By 2007, due in part to work rule changes, Peoples Gas reduced the GOS workforce to 22 employees (6 management and 16 union personnel). Peoples Gas reported that overdue valve inspections numbered 13, 38, and 8 for the years 2005 through 2007, respectively.<sup>85</sup>

A Navigant Consulting report dated July 2006 determined that Peoples Gas had not completed its 2005 valve inspection record audit.<sup>86</sup> The Navigant report also indicated that Peoples Gas needed to create a valve-inspection history report to track valves that cause continual problems so that GOS might focus its inspections and maintenance. Peoples Gas has not yet implemented a system to track valve inspection and maintenance histories.

GOS personnel now operate each valve, other than plastic valves, during the inspection to ensure they move.<sup>87</sup> The force needed to “crack” plastic valves may inadvertently shut them completely, especially the smaller diameter valves. Liberty finds this to be a reasonable practice, especially if those plastic valves are located on systems providing a single gas feed to poor pressure areas, or areas that may rapidly lose pressure. The risk exists that operating the valve may result in shutting off gas supply inadvertently.

<sup>83</sup> Response to Data Request #104.

<sup>84</sup> Interviews Gas Operations Section, August 15, 2007, and November 15, 2007. Meter Runs are located at Gate Stations and at special meter locations of large volume customers.

<sup>85</sup> Response to Data Request #197.

<sup>86</sup> Response to Data Request #11A pages 79-89.

<sup>87</sup> Interviews, Gas Operations Section, August 15, 2007, and November 15, 2007.

#### **d. Odorization**

Peoples Gas' O&M Plan, Exhibit III contains its Gas Control and Odorization Plan.<sup>88</sup> It requires that all gas entering the City of Chicago be odorized such that gas in a distribution line is readily detected by a person with normal sense of smell at a concentration of one-fifth of the lower explosive limit (1 percent gas in air or 20 percent LEL - lower explosive limit).<sup>89</sup> Peoples Gas' plan indicates that its odorant injection levels are adequate based on consistent leak investigation patterns and results as well as levels of leak reports from customers and the public. The plan requires Peoples Gas to conduct weekly odorometer tests of distribution gas at Technical Training and Standards (TTS), the Main Office, North Shop, and South Shop. Peoples Gas' Field Service Department personnel also perform designated area surveys every two weeks.

Peoples Gas' odorant monitoring program is limited to these four points and none at the extremities to confirm proper concentrations of odorant. This is not sufficient to test the extremities of the system.

A TTS staff instructor is responsible for the calibration of odorization equipment, conducting weekly odorometer tests at Central shop, tracking odorometer sampling at North, South, Central and Downtown locations, and monitoring Distribution's gas odor survey.<sup>90</sup> Odorization readings are forwarded by e-mail or phone call to Technical Training where they are logged and maintained. Every two weeks Peoples Gas conducts a gas-odor survey program that samples the level of odorant in the gas at customers' appliances; 42 forms per month are forwarded to Technical Training. Technical Training issues a list of areas to be surveyed and Peoples Gas' personnel use "sniff tests"<sup>91</sup> to detect the odor of gas over 21 designated areas. Peoples Gas does not periodically verify its personnel who conduct such tests have sufficient olfactory senses to detect natural gas at code-mandated levels.

#### **e. Qualifications and Training of Personnel**

Chapter V of this report addresses Operator Qualifications (OQ) and the associated training requirements. This section provides a brief overview of the subject specifically with respect to valves, regulators, and system pressures.

GOS personnel are trained and qualified in their work duties by means of training classes held at the Crawford Station Training Facility. In addition, GOS provides hands-on training on the job in field situations and equipment inspections. Peoples Gas conducts training every three years and requalifies its personnel generally in the spring of that year. The Crawford Station is separate from Peoples Gas' Technical Training Center for Distributions and Service personnel. Due to the limited number of GOS personnel, Peoples Gas did not conduct training courses during the

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<sup>88</sup> Responses to Data Requests #1 and #2.

<sup>89</sup> Peoples Gas's O&M plan Exhibit III page 5 states that its gas is odorized to provide warning levels to 95 percent of the population at 20 percent LEL. Five percent of the population is anosmic (odor blind) and cannot be warned at any level of odorant injection.

<sup>90</sup> Interview Technical Training and Standards, November 15, 2007.

<sup>91</sup> Sniff tests are qualitative tests performed by individuals with normal sense of smell. Documentation of the odor test is logged on a Gas Odor Survey Form #3.



2007-2008 period of the Liberty audit. Therefore, this report will not comment on the scope and nature of training. This area should be evaluated or monitored during the next phase of this investigation.

GOS conducts OQ training in the following areas on a 3-year cycle:

- Abnormal Operating Conditions (AOCs)
- Regulators
- Valves
- Over-pressure protection devices
- Trainer Qualifications

GOS conducts limited three-day Annual Refresher Training for its personnel at the Crawford Station classroom facility, one day of which is instructed by the Safety Department (Human Resources), covering the following topics:

- Equipment Replacement Programs
- Valves
- Regulators
- Vaults – Double door square entryway

### **3. Conclusions**

#### **1. Peoples Gas completed its regulator and vault inspections in a timely fashion.**

Vault conditions and pressure recordings are taken at prescribed code mandated intervals. GOS is tracking those regulators that need closer attention due to maintenance history, (leaks, hard to operate, wear and tear on regulator components affecting pressures as evidenced on pressure charts, paved or otherwise covered over, etc).<sup>92</sup>

Results from Stoner modeling and review of pressure charts and chartless recording devices indicates that Peoples Gas has not identified nor does it have any known poor or inadequate pressure areas on its gas distribution system.<sup>93</sup>

#### **2. Peoples Gas' emergency valve sectionalizing design and valve placement is reasonable.**

Peoples Gas' critical valves sectionalizing criteria appears to be fully adequate. For its system overall, Peoples applies acceptable criteria for emergency sectionalizing valve design.

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<sup>92</sup> Response to Data Request #254.

<sup>93</sup> Responses to Data Requests #145 and #154.

**3. Peoples Gas did not complete all scheduled valve inspections and does not maintain a valve inspection history.** (Recommendations III-1 and III-2)

Valve Inspections that did not meet inspection timeframes numbered 13, 38, and 8 for the years 2005 through 2007, respectively. The Gas Operations Section personnel performing valve inspections has fewer personnel than it did just a few years ago and it appears that either that group or distribution field operations does not have the resources to complete annual inspections.

Navigant Consulting reported that Peoples Gas had not completed its 2005 valve inspection record audit. The Navigant report also indicated that Peoples Gas needed to create a valve-inspection history report to track valves that cause continual problems so that GOS might focus its inspections and maintenance. Peoples Gas has not yet implemented a system to track valve inspection and maintenance histories.

**4. Peoples Gas is experiencing some problems with downloading data for its electronic data recorders in regulator vaults.** (Recommendation III-3)

Peoples recently converted its pressure-recording charts in regulator vaults to electronic data recorders. However, it has problems with downloading data from the chartless recorders and being able to plot in output report formats. This type of problem may be associated with new equipment. Nevertheless, Peoples Gas needs to resolve the matter.

**5. The O&M plans address odorization code requirements.**

Peoples Gas' O&M plans address ICC §500.300 odorization requirements for adding odorant and having and following a monitoring plan. Federal regulation §192.625 requires Peoples Gas "... to assure proper concentration of odorant in accordance with this section, each operator must conduct periodic sampling of combustible gases using an instrument capable of determining the percentage of gas in air at which the odor becomes readily detectable." Peoples Gas conducts periodic sampling as required.

**6. Peoples Gas' program of odorant monitoring does not focus sufficient attention to testing at the extremities of the system.** (Recommendation III-4)

Peoples Gas' odorant monitoring program is limited to four points at which it tests weekly to confirm proper concentrations of odorant, using calibrated odorometers in the middle of the system and no testing at the extremities. Additionally, every two weeks Peoples' employees performs sniff tests by checking for gas odor over 21 designated areas. This is not sufficient to test the extremities of its system.

It is common industry practice to perform odorant tests at the extremities of the system to confirm the gas contains odorant. The guide material presented in the Gas Piping Technology Committees (GPTC) Guide for Gas Transmission and Distribution Piping Systems recommends that: "sampling sites should be selected to ensure that **all** [emphasis added] gas within the piping system contains the required odorant concentration."

**7. Peoples Gas does not test the olfactory senses of sniff testers.**  
(Recommendation III-5)

Peoples Gas employees perform sniff tests but are not tested themselves to ensure that their senses are working properly. Several factors can interfere with an individual's sense of smell. Examples of these include smoking, foods, chewing tobacco, gum, head cold, or other health-related conditions. Peoples Gas needs to ensure it periodically checks personnel who perform "sniff" tests to verify that they possess normal olfactory senses.

**8. Peoples' training facilities and curriculum covering valves and regulators appears adequate.** (Recommendation III-6)

The GOS Crawford Station training facilities covering valves and regulators has the equipment on which GOS personnel undergoing. OQ training may include hands on tear down and repair. The curriculum for training, which includes abnormal operating conditions, appears adequate.

Since no training or testing of GOS personnel took place during the course of this audit, Liberty did not evaluate whether the written and practical testing protocols were adequate. Liberty includes a recommendation on this subject for follow-up during the verification phase of this investigation.

**9. Peoples Gas' manual odorization documentation process and record system is time consuming and lacks a systematic and objective approach.** (Recommendation III-7)

An instructor at Technical Training and Standards (TTS) is responsible for the calibration of odorization equipment, conducting weekly odorometer test at Central shop, tracking odorometer sampling at North, South, Central and Downtown locations, and the bi-weekly distribution gas-odor survey. Field personnel forward their results of readings by e-mail or phone call to Technical Training where they are logged and maintained.

TTS also issues a list of areas to be surveyed, and a Field Service Department Supervisor schedules those surveys accordingly. Documentation of the odor test is logged on a Gas Odor Survey Form #3 and forwarded to TTS. This practice results in at least 42 paper forms per month that then need to be hand filed.

**10. Peoples Gas exhibits several "best practices" in its valve and regulator operations.**

Peoples Gas best practices in this area of its operations include:

- The use chartless recorders for pressure recording
- Use of Mooney regulators for control of distribution pressures
- Manual operation of valves during inspections
- Maintaining the system with no poor pressure areas
- Limiting the number of customers isolated and interrupted during emergency shutdowns.

## **4. Recommendations**

### **III-1 Determine the resources necessary to ensure all annual valve inspections are accomplished within scheduled timeframes.**

The group that performs valve inspections does not appear to have adequate resources to ensure annual inspection schedules are met. Peoples Gas needs to determine its workforce needs, both for GOS valve inspections, and for valve inspections performed by distribution field forces, based on work activities. It then needs to assign adequate personnel to complete the annual valve inspections.

Peoples Gas should complete the assessment of workforce needs within three months of the date of this report and make the appropriate adjustments within one year of the date of this report.

### **III-2 Develop a means to track and report histories of valve inspections to identify valves that cause continual problems, and to focus the inspections and maintenance on those problems.**

Peoples Gas should create a valve-inspection history report to track valves that cause continual problems so that GOS might focus its inspections and maintenance. Peoples Gas should implement this recommendation within six months of the date of this report.

### **III-3 Resolve interface problems with the chartless recorders.**

To take full advantage of chartless technology and to ensure there are no operating problems at its pressure regulation stations, Peoples Gas needs to identify and resolve the interface issues. Peoples Gas should implement this recommendation within six months of the date of this report.

### **III-4 Analyze the gas system to determine sampling sites that will ensure proper concentrations of odorant reaches all parts of the system.**

Peoples Gas needs to review the locations it tests to verify its odorant levels are adequate. The locations sampled need to include adequate representation at the extremities of the system to ensure odorant levels throughout the system are at code required levels. Peoples Gas should implement this recommendation within six months of the date of this report.

### **III-5 Develop a schedule and verify that personnel who perform “sniff” tests possess normal olfactory senses.**

Peoples Gas’ odorant monitoring program includes regular performance of sniff tests. Peoples Gas needs to implement a program to verify periodically that those employees performing the sniff tests are qualified to do so. Peoples Gas should implement this recommendation within six months of the date of this report.

### **III-6 Conduct adequate training for Gas Operations Section (GOS) on valves and regulators.**

This recommendation is a place marker for Liberty's review of this training in the next phase of this investigation.

### **III-7 Re-evaluate the odorant sampling and documentation paper system and convert it to an electronic format.**

The paper system in use is inefficient, bulky, and time-consuming. Peoples Gas should investigate the possibility of scheduling and recording odor tests through its Navigate system to eliminate the paper records created by the existing system.

Peoples Gas should develop a plan to implement this recommendation within three months of the date of this report.

## **B. Emergency Response**

### **1. Background and Objectives**

The Department of Transportation's Pipeline and Hazardous Materials Safety Administration (PHMSA), Pipeline Safety Regulations, 49CFR615 requires that each pipeline operator establish written procedures to minimize the hazard resulting from a gas pipeline emergency. The procedures must provide for receiving, identifying, and classifying notices of events that require an immediate response. They must also provide for (a) communications with fire, police, and other public officials, (b) a prompt and efficient response to notices of emergencies, and (c) the personnel, equipment, tools, and materials at the scene of the emergency.

Each operator must furnish the appropriate supervisors with a copy of the latest revision to emergency plans, train operating personnel on the procedures, verify the effectiveness of the training, and review actions taken to determine whether personnel effectively followed the procedures.

In addition to training its own personnel, operators should establish and maintain a relationship with fire, police, and other public officials to:

- Learn the responsibilities of each during a gas emergency
- Acquaint the officials with the operator's response to emergencies
- Identify the types of emergencies for which the operator will notify the officials
- Plan how the operator and the public officials can engage in mutual assistance during emergencies.

The City of Chicago designated the Fire Department as the lead city organization for responding and coordinating on all emergencies with Peoples Gas. Other city departments that may be involved include the Police Department (typically the Bomb and Arson Squad), the Department of Emergency Preparedness, the Department of Public Works, and the Department of Sewer and

Water. The Peoples Gas call center has a direct line to the fire department and both organizations staff these centers round-the-clock.

Many local gas companies provide training, both to internal and external individuals. They have included emergency response requirements in their O&M manuals.<sup>94</sup> Some companies have performed annual or periodic drills for internal individuals and some have performed simulated emergencies with both internal and external (governmental) resources. This latter method of advanced training goes beyond what is in the code but confirms that a company will be able to coordinate with governmental agencies in a true emergency and that its own employees know what to do, when to do it and who to contact. These periodic drills have become an industry best practice, and after 9-11, many utilities in urban areas have participated with governmental agencies, fire departments, police departments, emergency preparedness departments and home land security departments to maintain and enhance their responses to normal and possible terrorist derived emergencies.

The objectives of the investigation reported in this section of the report were to:

- Determine whether Peoples Gas' emergency plans met requirements
- Evaluate the emergency plans for completeness
- Assess the training on emergencies that Peoples Gas provided to its employees
- Review the liaison that Peoples Gas established with public officials with regard to emergency response.

## **2. Findings and Analysis**

### **a. Peoples Gas' Emergency Plan**

Peoples Gas' Emergency Operating Plan (EOP) is Exhibit VII to the company's O&M Manual.<sup>95</sup> The EOP contains the following major sections:

- Objectives
- Internal Call Procedures
- Liaison Procedures
- Response Procedures (City of Chicago)
- Response Procedures Transmission System (Outside City Limits)
- Notification of Outside Agencies
- Emergency Material and Equipment
- Contractors and Utilities
- Emergency Response Contacts
- Personnel Training

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<sup>94</sup> O & M Manuals: Operations and Maintenance Manuals are documents that gas operators are required to maintain and update per 49CFR192.605. These manuals detail how operators handle maintenance and operating situations and what actions they will take, what procedures they will follow, and the requirements with which they must comply.

<sup>95</sup> Responses to Data Requests #1 and #3.

- Public Education

The stated objectives of the EOP are to provide for the immediate investigation of all reported emergencies and to describe the immediate actions company personnel should take in the event of an emergency. Section II of the EOP contains the procedures for receiving and identifying notices of emergencies. Section IV defines three levels of emergency classification. Section V of the EOP addresses communications with fire, police, and other public officials. Section IV provides the actual response procedures, including the personnel on the scene. Section VI describes and lists the emergency equipment, tools, and materials that are available.

**b. Internal Emergency Plan Training**

Federal Regulation 49CFR§192.615 requires that Peoples Gas train operating personnel on emergency procedures, verify the effectiveness of the training, and review actions taken to determine whether personnel effectively followed the procedures. Section IX of the EOP outlines Peoples Gas' training plan. It includes initial training for new personnel, annual update training for all employees on changes to the EOP, which could include mock emergency drills in a classroom setting (*i.e.*, tabletop drills) or reviews of actual incidents in a case study format. Section IX requires Peoples Gas to maintain documentation of this training for all management and technical personnel. The EOP indicates that non-management field employees receive emergency response training included in their "Abnormal Conditions" course, as part of operator qualification training. All emergency first responders need to be trained to properly evaluate situations that may arise when they are called to the scene of an incident or a gas leak. These first responders need to have the knowledge to order an evacuation if necessary and to call for additional assistance. They are not expected to make the situation safe but rather to protect lives rather than property as specified in §192.615.

Peoples Gas conducted the bi-annual emergency response training for 2005 with a series of classroom sessions held from December 1-16, 2005.<sup>96</sup> Over 280 management and technical personnel completed that training. For 2007, Peoples Gas provided the emergency plan training to a similar number of employees using a series of four on-line "E-Learning" modules completed in December 2007.<sup>97</sup> Trainees completed these modules over a several-day period in early December 2007. Peoples Gas thought this method of training was more advantageous because each individual could complete the required modules at his or her own pace. Several interviewees indicated that they thought the training was not as effective as previous training. Peoples Gas did not solicit feedback on the effectiveness of this new method of emergency training.

**c. Relationship with Fire, Police, and Other Public Officials**

Regulations 49CFR192.615 require that Peoples Gas establish and maintain a relationship with fire, police, and other public officials to learn the responsibilities of each during a gas emergency and to acquaint the officials with Peoples Gas' response to emergencies.

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<sup>96</sup> Response to Data Request #187.

<sup>97</sup> Response to Data Request #187.

Section III of the EOP specifies that throughout the City of Chicago, the Fire Department is the agency with overall emergency response and disaster recovery responsibility. Peoples Gas' liaison with the City of Chicago includes providing:

- Training courses about natural gas system awareness including properties of natural gas, the identification of various company facilities, and the effect of hits on gas-related facilities.
- Training courses for personnel from the Police Department, Fire Department, the Department of Water, the Department of Sewers, and O'Hare Airport contractors.
- A current listing of key company personnel who they can contact if necessary. The two primary contacts are Gas Control and Citywide Dispatch, which are company locations staffed 24 hours per day.
- Descriptions of Peoples Gas' equipment, material, and staffing capability at various geographic locations throughout the City.

Peoples Gas provided training materials used for outside emergency responders (*i.e.*, Chicago police and fire departments) including the dates, locations, and all of the attendees.<sup>98</sup> Peoples Gas gave gas appliance safety training to the Chicago Fire Department in June 2007, gas safety training to the Chicago Police, Bomb and Arson Section, and the Fire Department, Office of Fire Investigations, in March 2007 (three sessions), and gas safety training to the Chicago Fire Department in September 2004 and December 2000.

The presentations given to the Chicago Police Bomb and Arson Squad (in 2007) included aspects such as the natural gas infrastructure in Chicago and the location and purpose of Peoples Gas' facilities in Chicago and the surrounding area. Additionally, the training described how Peoples Gas performs leak surveys, the meaning of the different grade of leak and the responses and requirements attached to each grade of leak. The training did not seem to describe how Peoples Gas will respond to an emergency, which personnel would respond, and which personnel would have overall control of an emergency situation via the EOP. The presentation did provide the supervisor in charge of the main facilities.

The Police Commander indicated that Peoples Gas was doing a very good job in responding to leaks and incidents that included fires and explosions. He said that the training his squad received in 2007 was excellent. He would like to make this training available to all of his new detectives. He suggested that Peoples Gas consider providing training some of the beat officers who in many situations may be the initial responders. He said that the Peoples Gas personnel handled themselves very well at incidents, have good maps, and appear to have all of the necessary resources. He was very positive on Peoples Gas' emergency performance.

The training programs given to various groups in the Chicago Fire Department, the Chicago Police Department Bomb and Arson Squad, the Chicago Water and Sewer Department, and the O'Hare Airport Maintenance Department covered all necessary and required information. The information contained in most of the training consisted of gas safety information, information on how natural gas is transported from the well to Chicago, facts about where incidents could occur

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<sup>98</sup> Response to Data Request #140.



on the Peoples Gas' infrastructure, and other pertinent facts regarding natural gas, its uses, and how to safely handle it. The materials discussed the physical attributes of natural gas such as explosive limits and the fact that an odorant must be added in order to be able to smell the presence of escaping gas.

The Fire Marshall in the Chicago Department of Fire indicated that it usually takes one-half to one hour to have Peoples Gas personnel on the scene during an emergency. He also said that he was interested in having more of the fire marshals in the investigation unit trained by Peoples Gas, but that to date Peoples Gas had not offered to do more training sessions for the fire department.<sup>99</sup>

#### **d. Emergency Response Procedures**

Section IV of the EOP contains the detailed procedures for Peoples Gas' actions in emergencies. It provides information and action steps that apply to any emergency and contains appendices that deal with particular types of emergencies such as:

- Widespread Interruption of Gas Supply
- Gas Supply Interruption at a Gate Station
- Significant Release of Gas to the Atmosphere
- Explosion or Fire
- Malfunction of Major Gas Equipment
- Excessive Pressure in the Distribution System
- Acts of Vandalism or Sabotage to Gas Facilities

Section IV repeats the emergency classifications that defined earlier in the EOP. The definition of emergency levels is based on the significance of the incident and the amount of resources required in the response. In summary, these are:

- Level I
  - Handled using local or departmental resources.
  - Effectively mitigated using the department's emergency operating procedures.
- Level II
  - Creates substantial danger to life and health of workers, the public, the environment, or company operations.
  - Typically requires some degree of support from company divisions and service providers outside of the affected division.
- Level III
  - Adversely affects the business as a whole and requires extensive support from outside the division and/or the company.
  - It is an event that turns all resources and employees' attention to emergency mitigation and resolution; it becomes the primary priority.

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<sup>99</sup> Telephone Interviews, February 19, 2008, in person interview with Fire Marshal on May 7, 2008.

The EOP lists the ways by which Peoples Gas typically learns an emergency. These include:

- Two “hot line” telephones from the Fire Department that the company’s Citywide Dispatch answers. Citywide dispatch is a call center that Peoples Gas operates to schedule service work and to respond to emergencies and reports of escaping gas (odor reports from the public, customers, city agencies, etc.). This center is located in the [REDACTED] and is manned 24 hours per day and 365 days per year. It is a location that can contact not only company officials, but also city and state officials. Some of the ways that Peoples Gas is notified of a gas leak (*i.e.* an odor report):
  - A direct call to Citywide Dispatch from the Fire Department, the Police Department, or the Office of Emergency Management.
  - A customer report to the Customer Care Center.
  - A call to the Customer Care Center or Central Dispatch from any member of the public.
  - Monitoring of Fire Department scanner radios located in Citywide Dispatch. (Citywide Dispatch is manned by dispatchers who monitor the radios and can contact either service or operations personnel to report to the scene of an emergency)
  - Direct calls to Gas Control from the Police Department, customers, or the public.

The Peoples Gas EOP requires that it notify the City Department of Environment (CDOE) of outages caused by third party hits to gas facilities that affect 10 or more customers and any other significant event that affects or may affect the safety of the public or will receive media coverage. If the incident is severe or of such a nature that the Fire or Police Departments should be informed, Gas Control or Citywide Dispatch calls 911 for assistance.

Section IV requires Company personnel to respond to every emergency reported to Peoples Gas. It dispatches either a service or gas operations employee to every emergency call received. The company immediately dispatches a field service supervisor to certain events such as any reported explosion. Peoples Gas may also initially dispatch additional company personnel when a school, hospital, or nursing home is involved or when other conditions known at the time of notification warrant additional personnel. Senior Service Specialists, among the most experienced employees in field service, respond to all odor complaint calls. They are qualified to repair most inside piping and above ground leaks. Only gas operations trucks have access to maps in Navigate and if a service person needs to shut down a service or assist with other first responders, they need to call dispatch to have them lookup where the service and street valves are located.

Citywide Dispatch will notify the appropriate district manager, or the designated alternate management employee, for certain listed events and whenever warranted by their judgment. The plan enumerates the steps that the district manager should take. The district manager will be in charge of the response efforts unless a higher authority relieves and may assume the role of the field incident commander in some situations.

The plan also enumerates the duties of the first responder or senior service specialist at the scene. In all cases, the first priority is to take whatever actions are appropriate to protect people. Some of the action steps are:

- Take appropriate corrective action to protect people and make the gas facilities safe.
- Establish communications with and obtain names of fire, police, and public officials directing operations.
- Determine the probable cause, and origin of the incident, and limits of the area affected as soon as practical.
- Maintain careful records of time and location of gas shutoffs.
- Promptly notify Citywide Dispatch of preliminary information.
- Maintain frequent contact with Citywide Dispatch.

The warnings and directions listed for the on-scene personnel include:

- Evacuate the premises if there is an accumulation of gas inside a building near or exceeding the lower explosive limit.
- Ventilate the premises.
- Stop further escape of gas, if possible. Employees are authorized and expected to close valves as required to stop the escape of gas or eliminate a source of overpressure.
- Eliminate sources of ignition. Shut-off open flames by manually closing valves. Do not operate a thermostat or other control device as they may create a spark. Do not operate electric switches or light matches, and instruct others present not to do so.
- Do not extinguish a gas flame until its source of gas is shut off.
- Keep all unauthorized persons clear of the hazardous area.

Section IV also describes the maps and emergency valve register included in the EOP. The maps show the interconnecting mains and valves, which comprise the medium pressure and high-pressure main systems. The maps are broken down into 54 views covering the city and a separate map for O'Hare airport. Each view covers up to six square miles. The maps are available in the field to supervisors and some field employees. Detailed maps are available in hard copy and on lap top computers in the field for operations personnel but not for service personnel. Service personnel do not have access to the maps in Navigate while operations personnel have unlimited access.<sup>100</sup>

The emergency valve register lists each valve by number. The register contains the valve type, size, location, number of turns to close and other pertinent information that could be helpful in an emergency. The maps identify each valve by number along with the size of the main. When a fault occurs in any part of the system, personnel can isolate the fault section by closing the appropriate valves.<sup>101</sup>

At Peoples Gas, the three district shops and the Gas Operations Section at Division Street have area isolation capability. Thus, each shop and Division Street have the capability of isolating sections of the gas system in their areas or citywide. Since Division Street is closest to downtown, in an emergency, individuals from Division Street could be dispatched to downtown

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<sup>100</sup> Interviews with Service Section first responders on May 7, 2008.

<sup>101</sup> From Peoples Gas EOP, Section IV, page 7, responses to Data Requests #1 and #3

to sever the gas flow to an area by using the emergency isolation valves that are tested yearly. In this instance, the response could be quick and the consequences of the emergency may be reduced (*i.e.*, a reduction in the time gas is flowing to a fire or if an explosion were imminent).<sup>102</sup>

### **3. Conclusions**

#### **1. Peoples Gas meets requirements for having a documented emergency plan.**

Peoples Gas' Emergency Operating Plan (EOP) is Exhibit VII to the company's O&M Manual. It contains all of the basic elements required by 49CFR615. The EOP is detailed. It provides general and situation specific procedures. It describes emergency materials, reporting and contacting information, telephone contact numbers, and training requirements.

#### **2. Training of Peoples Gas' employees meets the code requirements but should be improved.** (Recommendations III-8 and III-10.)

The training that Peoples Gas provides its employees, besides the service section first responders, barely meets the code in that it provides the basics for each employee to respond to an emergency and then to call for assistance. The training does not evaluate how well employees are trained except by having them complete a test right after the training session. There is no mechanism for Peoples Gas to evaluate the training in realistic scenario type training nor does Peoples Gas solicit feedback on the training. The Technical Training Manager stated that the recent e-learning type training was well received but several employees that were interviewed stated the prior method of training was better in that there was more interaction between the instructors and the trainees and that computer essentially had no interaction with trainees besides saying when they had a wrong answer on the test.

#### **3. Peoples Gas' liaison with city departments has been adequate. However, it should conduct additional external training.** (Recommendations III-9, III-10, and III-11.)

Peoples Gas provided periodic training to Police, Fire, Water and Sewer and O'Hare airport personnel. Typical training for Police and Fire personnel has been performed every three years while training for Water and Sewer and O'Hare airport have more sporadic (*i.e.*, one time training in the period of 2000 through 2007). Interviews conducted with Police and Fire representatives and first responders from Peoples Gas indicated that there is good coordination and liaison between the company and city departments. None of the reviews for major incidents cited coordination or liaison issues with city departments and Peoples Gas' first responders defer to the fire department battalion chiefs for direction and assignments.

Peoples Gas did not conduct joint training with city departments; it did not conduct realistic drills that included city departments.

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<sup>102</sup> From Peoples Gas EOP, Section IV, page 7, responses to Data Requests #1 and #3, interviews on May 7, 2008 with both Service and Operations Sections

**4. Peoples Gas' emergency response procedures are adequate. Service personnel do not have access to maps that could aid in emergencies.**  
(Recommendation III-12.)

Peoples Gas' emergency response procedures are detailed and reasonably well organized. They provide general guidelines and specific steps that various parts of the organization or individuals should take. They are readily available to emergency response personnel as part of the company's O&M manual. Because of the detail in the plan, Peoples Gas needs to ensure that it maintains procedures up to date. Personnel and telephone number changes occur frequently and can affect the accuracy of the plan. Also because of the detail, it is essential that emergency response employees are familiar with the plan's content and organization.

Service personnel do not have access to the maps in Navigate while operations personnel have unlimited access.

## **4. Recommendations**

### **III-8 Increase the frequency of employee emergency-plan training.**

Peoples Gas conducts initial EOP training for new employees every year, provided there are a sufficient number of new employees. In 2005, Peoples Gas conducted classroom training and in 2007, it provided on-line training modules. The complexity and detail provided in the EOP combined with regular personnel turnover or position changes demand that key emergency response personnel be made familiar with the EOP more often than every two years. Peoples Gas should conduct refresher training at least annually. Peoples Gas should implement this recommendation within six months of the date of this report.

### **III-9 Perform joint training with outside responders**

The EOP should require that there is some formal joint training between company and non-company first responders to an incident. This training would assist in developing an even stronger working relationship between Peoples Gas and the outside responders. Such a training exercise would also highlight any deficiencies in the Peoples Gas' EOP. Peoples Gas should conduct training exercises yearly until all lessons learned are resolved and each group is cognizant of the capabilities of the other. Peoples Gas should start such training in 2009.

### **III-10 Perform realistic drills with outside responders**

The EOP should require that some formalized drills be prepared based on lessons learned from actual incidents and these drills include most of the functions within the Peoples Gas organization who respond to emergencies and non-company organizations, such as the Chicago Fire Department and the Chicago Emergency Planning organization.

### **III-11 Increased training for outside first responders**

Peoples Gas should increase the frequency and the scope of training for outside first responders (*i.e.*, Chicago Fire Department, Chicago Police Department, and Chicago Water and Sewer

Department) to handle personnel turnover and new individuals and to improve and cover not only the normal response but also lessons learned from the most recent incidents.

### **III-12 Provide map access for service section personnel**

The service section should have access to maps in Navigate as does gas operations. This could speed the response to some emergencies and would reduce the load on Citywide Dispatch during the emergency.

## **C. Leak Management**

### **1. Background and Objectives**

Leak management involves the company's response to reports of gas leaks and odors. Good leak management means that the company has crews available to investigate leaks, is able to respond to leak reports quickly, and has the supervision and experience to determine the degree of hazard and make the area safe. Other important aspects of leak management are the use of leak history records, the approach to leak hazard classification, post-repair surveillance, the effectiveness of the repairs, and the effectiveness of the company's messages to customers about reporting possible leaks.

Applicable code requirements for leak management are contained within:

- State of Illinois Title 83: Public Utilities Administrative Code Part 500 Standards of Service for Gas Utilities
- Part 590 Minimum Safety Standards for Transportation of Gas and for Gas Pipeline Facilities
- USDOT 49 CFR Part 192 Subpart M – Maintenance, Subpart L- Operations, and Part 191.11 Distribution Annual Reports

More specifically, the code requires that the company must:

1. Have and follow procedural manuals (O&M procedures) that address how it handles leak and odor complaints and emergencies. §192.603 §192.605 (a)
2. Have qualified personnel to implement leak management activities. §192.805
3. Ensure that its personnel receive and respond promptly to reports of leaks. §192.605 (b) (11), §192.615 (a)
4. Ensure its personnel investigate, make safe, classify, repair and clear gas piping leaks. §192.703
5. Ensure it repairs hazardous leaks promptly. §192.703
6. Have procedures that address how its personnel conduct leak surveys, patrols, and use leak detection equipment. §192.723
7. Have processes for identifying the cause of leaks and failures on its distribution system. §191.11, §192.613, §192.617
8. Maintain documentation and records of its leak survey and leak handling activities. §192.605

Liberty's objectives for the review reported in this section were to evaluate Peoples Gas':

- Leak response procedures

- Leak survey requirements, performance, and documentation
- Leak investigations and repairs
- Leak backlogs
- Qualifications of leak survey personnel
- Practical testing of leak survey personnel

## 2. Findings and Analysis

### a. Leak Response Procedures

Peoples Gas' O&M Plan, Exhibit II Field Service Manual, section 11 Leak Investigations, describes the actions its field service employees must take when responding to and investigating calls from members of the public who suspect a gas leak or a gas odor.<sup>103</sup>

Peoples Gas' Customer Care Call Center representatives handle emergency calls from customers and initiate information in the C/First system. This populates emergency order information within Advantex, Peoples Gas' dispatching software.<sup>104</sup> At Peoples Gas' Citywide Dispatch, supervisors ensure that dispatchers (one for each geographic district North, South, Central and North Shore Gas), monitor Advantex and dispatch all same-day emergency orders.

Peoples Gas assigns one of two priority codes to leak orders.<sup>105</sup>

- Very high priority
- Routine odor complaint

It dispatches emergency leak and damage complaint orders immediately. Senior Service Specialists are available to respond immediately to emergency orders and same day priority complaints. Peoples Gas indicated that the Citywide Dispatch Center assigns leak and odor complaints upon order initiation and Senior Service Specialists are available to receive the order.<sup>106</sup>

### b. Leak Survey Performance, and Documentation

Gas pipeline operators must survey their gas lines with instruments capable of detecting gas concentrations of very small quantities. The Peoples Gas O&M plan Exhibit IV states that distribution mains are leak surveyed in accordance with Distribution Department Leak Survey Manual according to the following schedule shown in the tables below.<sup>107</sup>

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<sup>103</sup> Response to Data Request #2. In addition, the O&M Plan Distribution Manual Volume I, Exhibit I, General Order 0.300 contains Peoples Gas' procedure for its distribution personnel in reporting, classifying, rechecking, repairing and clearing of outside natural gas leaks.

<sup>104</sup> Interview #11, July 18, 2007.

<sup>105</sup> Comments on draft report, August 8, 2008.

<sup>106</sup> Interview with Manager, Central Operations, July 17, 2007.

<sup>107</sup> Peoples Gas O&M Plan Exhibit IV Safety Inspection Program 2007. "Annually" is defined as a period not exceeding 15 months, but at least once each calendar year.

**Distribution Mains in Business Districts**

<b>Survey Group</b>	<b>Surveyed By</b>	<b>Minimum Required Frequency</b>	<b>Peoples Gas Objective Frequency</b>
High Pressure	Dist. Depart.	Annually	Annually
Medium Pressure Outside of Loop	Dist. Depart.	Annually	Annually
Medium Pressure in Loop	Dist. Depart.	Annually	3 times a year
Low Pressure Outside of Loop	Dist. Depart.	Annually	Annually
Low Pressure In Loop	Dist. Depart.	Annually	3 times a year
Medium Pressure Station Piping	Gas Operations	Annually	Annually

**Distribution Mains in Residential Areas**

<b>Survey Group</b>	<b>Surveyed By</b>	<b>Minimum Required Frequency</b>	<b>Peoples Gas Objective Frequency</b>
High Pressure	Dist. Depart.	Not exceeding 5 years	Annually
Medium Pressure	Dist. Depart.	Not exceeding 5 years	Annually for Cast & Ductile Iron Mains Not exceeding 5 years for Steel and Plastic Mains
Low Pressure	Dist. Depart.	Not exceeding 5 years	Not exceeding 5 years
Medium Pressure Station Piping	Gas Operations	Not exceeding 5 years	Annually
Noncorrosion Protected Steel Main (per 192.465e)	Dist. Depart.	Not exceeding 3 years	Annually



**Service Lines – All Areas**

<b>Survey Group</b>	<b>Surveyed By</b>	<b>Minimum Required Frequency</b>	<b>Peoples Gas Objective Frequency</b>
High Pressure Inside Outside	Service Dept. Dist. Depart.	Annually	Annually
Loop (Outside)	Dist. Depart.	Annually	3 times a year
Loop (Inside)	Service Dept.	Annually	Annually
Cast and Ductile Iron Medium Pressure	Dist. Depart.	Annually in Business District. Not exceeding 5 years in Residential.	Annually
Business District Inside Outside	Service Dept. Dist. Depart.	Annually	Annually
Residential Inside Outside	Service Dept. Dist. Depart.	Not exceeding 5 years	Not exceeding 5 years
Non-corrosion protected metallic service pipe (in any survey group) (outside only)	Dist. Depart.	Not exceeding 3 years	Not exceeding 3 years

Federal Code §192.723 (b) requires that: “The type and scope of the leakage control program must be determined by the nature of the operations and the local conditions, but it must meet the following minimum requirements:

- (1) A leakage survey<sup>108</sup> with leak detector equipment must be conducted in business districts, including tests of the atmosphere in gas, electric, telephone, sewer, and water system manholes, at cracks in pavement and sidewalks, and at other locations providing an opportunity for finding gas leaks, at intervals not exceeding 15 months, but at least once each calendar year.
- (2) A leakage survey with leak detector equipment must be conducted outside business districts as frequently as necessary, but at least once every 5 calendar years at intervals not exceeding 63 months. However, for cathodically unprotected distribution lines subject to §192.465(e) on which electrical surveys for corrosion are impractical, a leakage survey must be conducted at least once every 3 calendar years at intervals not exceeding 39 months.”

In determining business districts, the following should be considered:<sup>109</sup>

- (a) Areas where the public regularly congregates or where the majority of the buildings on either side of the street are regularly utilized, for industrial, commercial, financial, educational, religious, health or recreational purposes.

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<sup>108</sup> The GPTC (Gas Piping Technology Committee) Guide Appendix G-192-11 defines Surface Gas Detection Survey as: “A continuous sampling of the atmosphere at or near ground level for buried gas facilities and adjacent to above-ground gas facilities with a gas detector system capable of detecting a concentration of 50 parts per million gas in air.

<sup>109</sup> The GPTC Guide for §192.723

- (b) Areas where gas and other underground facilities are congested under continuous street and sidewalk paving that extends to the building walls on one or both sides of the street.
- (c) Any other area that, in the judgment of the operator, should be so designated.

Peoples Gas has not reviewed the boundaries of its business districts within recent memory.<sup>110</sup> Peoples Gas should have a process that periodically evaluates its business districts. The nature of neighborhoods and businesses change over time and Peoples Gas' procedures should define a frequency within which it identifies its business districts for leak survey and pipe replacement practices.

The USDOT has continued to remind state safety regulators that a service line ends at the outlet of the customer meter or at the connection to the customer's piping, whichever is further downstream, or at the connection to customer piping if there is no meter. ICC §500.340 states: "For the purpose of this Section, a service pipe shall be the piping extending from the utility's main to and including the first fitting or valve inside the building wall, and for outside meters the piping extending from the utility's main to the inlet connection of the meter." As a result, the ICC has required Peoples Gas to conduct inside safety inspections to the meter if accessible.

Peoples Gas' mainframe computers identify dates by which locations of pipe system sections are to be leak surveyed and generate work orders to the Navigate System, which then electronically dispatches work orders to the three field shops, according to the following schedule:<sup>111</sup>

- Plastic and cathodically protected steel lines – every 5 years
- Other types of materials – every 3 years
- Cast iron and ductile iron MP – annually
- Downtown Loop outside area - three times yearly
- Business Districts – annually

The General Manager of Field Operations and operations managers for the shops receive a set of computer reports on a weekly basis that alerts them to those activities due for inspection within 30 days, leak surveys, main segments, and services.<sup>112</sup> The General Manager also gets a report of those activities whose inspections are due within 60 days, but whose orders are not yet issued, to ensure that the computer systems are working as expected to issue inspection work orders. Due to the age of the legacy computer systems, some of this information may not always be accurate. Liberty discusses issues associated with the legacy computer systems in Chapter V of this report.

The Navigate system receives work orders from the mainframe for scheduling and workload management. Monthly, a general supervisor prepares a survey workload schedule for his district and provides this to the survey crews via the Navigate system.<sup>113</sup> This is an example of the type

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<sup>110</sup> Interview #45, May 14, 2008, General Manager Field Operations. In its comments on the draft report, Peoples Gas indicated that business district classifications were re-evaluated in 2007 and changes implemented at the beginning of 2008.

<sup>111</sup> Response to Data Request #239, Interview July 17, 2008, Manager, Central District.

<sup>112</sup> Interview #2, June 4, 2007, General Manager Field Operations.

<sup>113</sup> Interview June 17, 2007, General Supervisor, Central District.

of scheduling activity that the System Field Support function could perform to relieve the workload on General Supervisors. (Refer to section V.C of this report.)

Progress in accomplishing leak surveys is tracked and updated in the Gas Main On-Line System (GMOS) for mains and the Distribution Management Information system (DMIS) for service lines. GMOS and DMIS generate hard copy weekly, bi-weekly, and monthly reports to identify pending work.<sup>114</sup>

As part of its activities to comply with leak surveys of its distribution lines, Peoples Gas conducts Inside Safety Inspections (ISIs) of its service lines where meters are located inside buildings<sup>115</sup> a minimum of once every 3 years.<sup>116</sup> Operations Apprentices (OAs) conduct these ISIs with a gas detection instrument such as a combustible gas indicator (CGI) inside buildings for leaks, and perform verification inspections of pipe up to the meter and regulator for adequate supports, and for atmospheric corrosion of the gas pipe. Additionally, qualified Gas Operations division employees are required to complete ISIs whenever they are inside a premise and gain access to company exposed gas service piping between the point of entry into the building of the service pipe and the outlet of the meter.<sup>117</sup>

### c. Leak Response

A leak response time is the period from receipt of a call until the first responder arrives at the site. The initial portion of the period is the time from receipt of the call until dispatch, a measure of emergency response crew availability.

Liberty reviewed Peoples Gas' dispatch times and its time from receipt of the emergency call to time of arrival. Peoples Gas tracks its response time to leak calls in increments up to 60 minutes and then aggregates responses taking more than 60 minutes. Liberty reviewed response times in 15-minute increments for the years 2005, 2006, and the first half of 2007.<sup>118</sup> Average total weighted response time for response to leak and odor complaints was 23+ minutes (including responses during and after normal business hours, Saturdays, Sundays, and holidays). Peoples Gas' goal is to reduce this response time to 22 minutes for one calendar year.<sup>119</sup>

The percentage of highest-level emergency orders dispatched within 10 minutes improved from 85.8 percent in 2005 to 86.5 percent in 2006, with the average dispatch time for all emergency orders decreasing from 6 minutes to 5 minutes.

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<sup>114</sup> Interview July 17, 2008, Manager, Central District.

<sup>115</sup> Peoples Gas currently has 14,600 inside medium pressure service regulators and 332,200 inside low-pressure meters requiring inside leak inspections. Peoples Gas would like to see ISIs based on risk where less frequent inspections of good performing plastic and cathodically protected steel are performed, significantly reducing this effort.

<sup>116</sup> Peoples Gas Field Service Manual Exhibit II, Section 16.2 Rev 4/30/07.

<sup>117</sup> Peoples Gas Field Service Manual Exhibit II, Section 11 page 3 Rev 4/30/07.

<sup>118</sup> Response to Data Request #61.

<sup>119</sup> If responses to emergency orders exceed one hour, the ICC requires Peoples Gas to document an explanation.

Liberty compared Peoples Gas’ response times to the standards established by New York State, the only state for which such standards were readily available.<sup>120</sup> The tables below show Peoples Gas’ response times to the highest-level emergency calls and to all calls.

**Response Times to Highest-Level Emergency Calls**  
 (Percent of Calls – call receipt to arrival at the site)

Calls Responded to Within:	N.Y. Standard	Actual 2005	Actual 2006
30 Minutes	75	77.8	80.9
45 Minutes	90	87.3	88.6
60 Minutes	95	~99	~99

**Response Times to All Calls**  
 (Percent of Calls – call receipt to arrival at the site)

Calls Responded to Within:	N.Y. Standard	Actual 2005	Actual 2006
30 Minutes	75	72.4	73.5
45 Minutes	90	83.8	84.8
60 Minutes	95	~99	~99

Peoples Gas met two of the three standards for the highest-level emergency calls and one of the three standards for all calls. Peoples Gas had a high percentage of responses within 60 minutes.

Peoples Gas indicated that it reduced the number of responses in excess of 60 minutes from 214 leaks in calendar year 2005 to 103 leaks in calendar year 2006. However, for the first six months of 2007, this total was 77.<sup>121</sup> The table below summarizes Peoples Gas’ reasons for the responses exceeding 60 minutes.

**Call Responses Exceeding 60 Minutes**

Explanation	2005	2006	2007 Jan-Jun	Total
Excessive Leaks/Not Enough Resources	182	65	44	292
High volume of Foreign Odor	17	14	9	40
Extreme Weather Conditions	4	6	18	28
System Error	0	18	0	18
Employee/Computer Problems	11	0	4	14
Vehicle Breakdown	0	0	2	2
Total	214	103	77	394

Of those leaks taking more than 60 minutes to respond, Peoples Gas indicated that “Excessive Leaks and Not Enough Resources” accounted for 85 percent in 2005, 63 percent in 2006, and 57 percent for the first six months of 2007.

<sup>120</sup> State of New York Department of Public Service Gas Safety Performance Measures Report November 2002

<sup>121</sup> Response to Data Request #62.

#### **d. Leak Survey Performance and Documentation**

Peoples Gas conducts most of its leak survey programs using Operations Apprentices (OAs). Peoples Gas indicated that OAs are typically on the job doing field service or distribution work between one and three years before they are scheduled for leak survey school, based on need for leak survey persons. Peoples Gas also uses some more senior mechanics to perform leak surveys.<sup>122</sup>

When a leak survey operator detects an indication of natural gas, the procedures call for the use of impact bars<sup>123</sup> to assess the hazard area, and to follow General Order 300 leak investigation guidelines for barhole gas-migration readings. The leak survey operator also is required to fill out a leak ticket form and enter the test point information into the Navigate system. Peoples Gas refers to this as the Navigate leak sketch.

OAs are only permitted to classify Type 1 hazardous leaks or Type 2 “non-hazardous” leaks.<sup>124</sup> If the OA detects a Type 1 leak, the OA or mechanic contacts Citywide Dispatch for that district. The dispatcher creates a leak order in C/First and dispatches the order to a Senior Service Specialist for above ground or inside leaks, or possibly a distribution first responder (General Supervisor or designated representative) for other types of leaks. The OA or mechanic is required to wait on site until the first responder arrives. While waiting at the site, the OA or mechanic is to continue to assess or define the perimeter of the gas leak and to evacuate or take action to protect life or property. A mechanic performing leak surveys is also permitted to classify leaks as Type 3. Type 2 and Type 3 leaks need not be called in immediately, but are turned in at the end of the day, unless the gas employee believes the nature of the leak requires immediate notice to the gas dispatcher.

Peoples Gas’ leak survey practices and its special patrols are effective in addressing winter conditions it experiences during the year and in addressing pipe materials on its system. Those practices include the following:<sup>125</sup>

- Cast iron main surveys
- Mains impacted by third party construction activities
- Leak hazards under frost conditions
- ABC surveys. (Readings must be taken when employees visit habitable structures at foundation wall, at the curb, and at valve boxes and other permanent openings such as centerline sewer.)

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<sup>122</sup> Interviews #14,15, & 16 August 13-14, 2007, North district & Interview #19 Central district

<sup>123</sup> Impact bars are driven into the ground making a barhole, which provides a means to take a gas-in-air reading of subsurface conditions and determine the migration pattern of a gas leak.

<sup>124</sup> Gas Leak Procedure General Order 0.300, Interview June 17, 2007, General Supervisor, Central District. Type 1 leak defined in General Order 0.300 is a leak that represents an existing or probable hazard to persons or property, and requires immediate repair or continuous action until the conditions are no longer hazardous. Type 2 leak is a leak that is recognized as being nonhazardous at the time of detection, but must be rechecked and re-evaluated once every 30 days until repaired.

<sup>125</sup> Leak Survey Manual 030507. ABC surveys are declared necessary by the General Manager of Field Operations during winter conditions whenever employees are at a building location under severe frost conditions.

- Efforts to reduce the backlog of Type 1 & 2 leak hazards prior to frost entering the ground.

#### **e. Leak Investigation and Repair**

Liberty reviewed a sample of leak response tickets and leak repair locations and determined that:

- Leak repair crews appeared to visit leak locations multiple times without completing repairs.
- Leak area investigation documentation was not consistent. Personnel should take leak area migration pattern and test-point readings each day the leak area is under evaluation, as well as when a leak-ticket sketch is initially prepared.
- Crews did not take advantage and use the information contained on leak repair sketches and barhole reading histories to evaluate changes in leak migration patterns and in determining where to make leak repairs.
- Peoples Gas trains crews to take actions to eliminate Class 1 criteria on a leak site, which allows them to downgrade the leak hazard classifications from Class 1 to Class 2 leak, often without making repairs. Means to downgrade leak classifications may include practices such as venting a leak area or placing a vented manhole cover over a manhole with an initial gas reading.
- Leak records showed that after downgrading a Type 1 to Type 2, Peoples Gas cleared the leak without repair, sometimes after a period of months and years.
- Peoples Gas' leak investigation and repair procedures do not contain a leak-repair recheck requirement to verify the effectiveness of repairs.

#### **f. Leak Backlogs**

As shown in section VI.B of this report, Peoples Gas has had a comparatively large leak backlog at year-end, a time of year when frost cover presents the highest risk for hazardous gas leak migration. Peoples Gas carried over 500 leaks in need of repair at year-end 2005. This level of backlog is high in relation to the number of leaks repaired.

The number of leaks in the backlog at year-end divided by the number of leaks repaired is a metric that reflects the risk posed to the public by allowing leaks to go un-repaired at year-end, a time when frost enters the ground and provides a greater risk of leaking gas migrating into habitable structures. Good operators reduce their leak backlog levels prior to frost conditions. Liberty compared this measure for Peoples Gas with a peer group. Peoples Gas' measure was about 25 percent while the peer group was below 10 percent.

#### **g. Training and Qualifications of Leak Response Personnel**

Federal Code requires that Peoples Gas have qualified personnel to perform leak management activities and procedures, including leak surveys, patrols, and the use of leak detection equipment. Section V.A of this report contains Liberty's evaluation of training and qualification. Liberty determined that Peoples Gas' leak-investigation course material covers the requirements contained in its procedures. However, Peoples Gas evaluates its leak investigation personnel

solely on a written test and does not have a means to test practical applications to leak areas, such as a physical or electronic leak simulation facility.

With the exception of clearing of leaks, Liberty's evaluation of Peoples Gas leak management personnel consisted of performing field observation audits of leak survey personnel conducting each of the above leak activities. Field observation audits involved accompanying both Peoples Gas mobile leak surveys and walking leak survey crews as they performed leak surveys, questioning individuals directly of their knowledge of procedures<sup>126</sup>, and ensuring that leak survey personnel checked leak survey equipment for proper functioning.<sup>127</sup> Liberty also witnessed leak site investigations and leak classifications performed by leak survey personnel. Finally, Liberty verified the training and qualifications records of individual leak survey personnel performing this function by reviewing records at the Technical Training Center.

The personnel Liberty observed performing the following leak management activities complied with Peoples Gas procedures.

- Leak surveys, including walking flame ionization, inside safety inspections, and mobile leak surveys
- Leak investigation, classification, and surveillance
- Leak repair
- Leak clearing

### **3. Conclusions**

#### **1. Peoples Gas' leak response procedures are comprehensive.**

Peoples Gas' leak response procedures require prompt response to the location of leak or odor complaints and continuous action until the leak no longer poses an immediate hazard. This means that Peoples Gas' crews will work a Type 1 leak until they repair it or reclassify it as a Type 2 leak.

#### **2. Peoples Gas does not regularly re-evaluate its business districts.**

(Recommendation III-13)

Over time, demographics change and business district boundaries change. Peoples Gas does not have any requirements to evaluate those changes and has not done so in recent memory. The district boundaries have important implications for leak survey requirements. In its comments on the draft report, Peoples Gas indicated that it re-evaluated business district classifications in 2007 and implemented changes at the beginning of 2008.

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<sup>126</sup> Distribution Department Leak Survey Manual Rev March 5, 2007, Mobile Leak Detection Survey Procedure, Flame Ionization Survey (Walking) Procedure, General Order 0.300 9/1/2006, and Field Service Manual O&M Plan Exhibit II Section 16 Inside Safety Inspection Program.

<sup>127</sup> Inspections conducted June 5 & 7, 2007, July 18, 2007, August 14-16, 2007, and September 17-20, 2007

**3. There is room for improvement in leak response times.** (Recommendation III-14)

When reviewed against standards established for New York State, Peoples Gas did not meet the benchmark for response within 45 minutes for the highest-level emergency calls and for the response within 30 and 45 minutes for all calls.

In addition, Peoples Gas indicated that the primary reason for responding to leaks in excess of 60 minutes was inadequate resources.

**4. Leak survey practices are effective.**

Liberty found that personnel performing walking flame ionization and mobile leak surveys were knowledgeable, thorough, and accurate. The OAs assigned to conduct flame ionization walking leak surveys were knowledgeable of leak survey procedures, knowledgeable of the proper operation of their leak survey equipment, thorough in performing required leak surveys over mains and services, and accurate in their classification of discovered leaks.

Liberty observed Peoples Gas personnel performing the mobile leak surveys at conservative speeds and in compliance with survey equipment specification and procedure requirements. Personnel were thorough in ensuring that they would detect leaks if present and accurate in depicting and classifying leak areas. Liberty also noted that the Peoples Gas mobile leak unit operator was knowledgeable in the proper operation of the optical methane detector vehicle.

Peoples Gas' leak survey practices and its special patrols are effective in addressing winter conditions, other conditions experienced during the year, and in addressing pipe materials.

**5. Peoples Gas' leak-survey detection equipment meets code requirements.**

Liberty observed walking leak survey crews using various leak detecting equipment, including:

- a mobile Optical Methane Detector (OMD),
- a remote methane leak detector (RMLD),
- a Flame Ionization (FI) Heath DETECTO-PAKs, and
- Southern Cross FI units.

The crews used OMDs for business district and high-pressure system leak surveys. Crews on residential streets used Heath or Southern Cross FI units. Liberty observed that the leak survey equipment used met the intent of code required leak detection equipment.

**6. Inside Safety Inspections do not address the threat of corrosion at the point of entry.** (Recommendation III-15)

Inside Safety Inspections do not address the threat from corrosion at a building's point of entry through the foundation wall. Pipe at the building foundation wall is more vulnerable to corrosion attack due to changes in oxygen levels, soils, materials, and chemicals leaching from the



foundation wall. Peoples Gas needs to emphasize this aspect of the inspection, and to change the ISI procedure and training materials.

**7. Peoples Gas' leak management practices exhibit a number of weaknesses.**  
(Recommendation III-16)

Liberty observed several leak management deficiencies, including:

- Leak repair crews appeared to visit leak locations multiple times without completing repairs.
- Leak area investigation documentation was inconsistent. The requirement for leak area migration pattern and test point readings each day the leak area is evaluated, as well as when a leak ticket sketch is initially prepared, must be clarified to ensure a consistent, systematic approach to leak site investigation.
- Crews did not use previously prepared leak repair sketches and barhole reading histories to evaluate changes in migration patterns and to determine where to make repairs.
- Peoples Gas crews often downgrade leaks without making repairs. Subsequently, downgraded leak classifications were often cleared without repairs.
- Peoples Gas leak investigation and repair procedures do not contain a leak repair recheck requirement to verify the effectiveness of repairs.

Collectively, the above practices have both safety and cost consequences. They result in a system with a lower margin of safety than desirable, and tend to increase costs due to multiple site visits without effective repairs.

**8. The leak backlog is too high.** (Recommendation III-17)

The level of backlogs at year-end is high in relation to the number of leaks repaired for the year. Peoples Gas needs to continually evaluate its leak backlog and ensure adequate manpower is available to keep it at an acceptable level.

**9. In addition to written testing, Peoples needs to include practical testing of leak investigation personnel.** (Recommendation III-18)

To ensure qualification of personnel responding to suspected gas leaks and gas odors, Peoples Gas needs to include practical testing of its leak survey crews and leak investigation and response personnel. A functional area such as leak response and investigation requires that Peoples Gas test its personnel in a practical examination such as in a "Leak Street" training environment or on leak investigation simulation software, in addition to any on-the-job testing or verification. Peoples Gas should include practical testing in its training program in order to qualify or requalify personnel.

## **4. Recommendations**

### **III-13 Evaluate business district boundaries.**

Peoples Gas has not reviewed the boundaries of its business districts within recent memory. Peoples Gas should have a process that periodically evaluates its business districts. The nature of neighborhoods and businesses change over time and Peoples Gas' procedures should define a frequency within which it identifies its business districts for leak survey and pipe replacement purposes.

In its comments on the draft report, Peoples Gas indicated that it re-evaluated business district classifications in 2007 and implemented changes at the beginning of 2008.

### **III-14 Improve leak response times.**

Peoples Gas needs to evaluate and determine how it may best improve its leak profile, specifically the percentage of response times of calls responded to within 30 minutes and within 45 minutes. Peoples Gas also needs to reduce the number of calls responded to in excess of 60 minutes.

Peoples Gas should evaluate alternatives for improving its leak response profile within three months of the date of this report. The evaluation should include specific recommendations, a schedule, and monthly performance reviews for meeting specific response time profile goals. The Company should implement those recommendations within six months of the date of this report.

### **III-15 Improve Inside Safety Inspection procedures and training.**

Inside service line leak survey inspections should include inspection for corrosion at the point of entry. This should include inspection of the "heel" of service inside of the building (between the building wall and the inlet to the meter/regulator set).

Peoples Gas should revise its current procedure and training materials, and implement the new procedure within six months of the date of this report.

### **III-16 Improve leak management practices.**

Peoples Gas can improve leak management practices through a number of actions:

1. Increase the percentage of repairs as opposed to investigations. In part, this will be accomplished through an increased presence of Peoples Gas supervision on site.
2. Improve the consistency of leak-area investigation documentation.
3. Ensure crews evaluate and use information contained on leak repair sketches and barhole reading histories.
4. Re-evaluate Peoples Gas' practice of reducing leak hazard classifications without making repairs at leak locations. Specific questionable practices include venting a leak area or placing a vented manhole cover over a manhole without continuous repair activities.

5. Re-evaluate Peoples Gas' practice of clearing leaks without repairs.
6. Institute a leak recheck of recently repaired leaks to verify the effectiveness of repairs.

Peoples Gas should develop a written plan for meeting these recommendations within six months of the date of this report. The plan should include revised procedures, training, implementing schedules, and specific quality assurance inspections to verify their implementation within one year of the date of this report.

### **III-17 Reduce the year-end leak backlog.**

Peoples Gas needs to repair more leaks and reduce the level of backlogs at year-end. In both relative terms, compared to its peers, and absolute numbers of leaks outstanding, Peoples Gas' leak backlog is too high. Peoples Gas should reduce the backlog so that the percentage of the leaks in backlog at year-end is less than 10 percent of the number of leaks repaired during the year.

Peoples Gas should develop and implement a written plan for meeting this recommendation within three months of the date of this report. The plan should include specific goals for reducing leak backlogs and repairing more leaks, including target levels for leak backlogs at year-end for the current and following two years.

### **III-18 Implement practical testing of leak investigation personnel.**

Leak investigation is not a textbook exercise. While there is a role for a written test in evaluating competence in the required activities, a practical test is also necessary to determine that the employees are able to perform adequately in the field.

Peoples Gas should begin to develop plans to address this recommendation within three months of the date of this report, and complete its implementation within one year of the date of this report.

## IV. Construction

### A. Background and Objectives

Construction materials and practices have improved significantly compared to those used by gas operators when they installed older distribution pipelines. Current materials, joining methods, and construction techniques (*e.g.*, coated, cathodically protected steel joined by welding or pull-out resistant couplings and poly-ethylene plastic joined by heat fusion) if applied correctly by gas pipeline operators today should provide for safe and reliable gas piping systems.

Operators should design and construct new pipe in a manner that minimizes both near-term and future problems. They should use the best available materials and joining methods and should prevent impacts from adjacent structures or harmful backfill material. They should verify the quality of plastic joints being fashioned at the beginning of each day, and test a sample of welds regardless of operating stress levels. Finally, operators should have remote access to records from field locations to verify plastic joiner (fusilier) and welder qualifications.

Operators should continually review and update their construction standards, specifications, and practices to reflect the use of state-of-the-art materials and construction techniques. As part of construction practices and techniques, operators should:

- Identify the limits of use of plastic materials
- Ensure backfill materials do not harm or adversely impact plastic pipe
- Document the location of their facilities using GPS coordinates whenever gas facilities are exposed, whether by excavation activities by others or their own crews and contracting forces
- Consider installing locating devices periodically along the length of new plastic mains and at plastic service line connections (as a precaution for compromised tracer wire) to be able to readily and accurately locate plastic pipe for future excavation
- Ensure coiled pipe is not adversely affected and properly re-rounded during colder weather installations
- Determine and address the reasons for plastic pipe and fusion failures.

Operators must also implement effective construction oversight processes and inspections to verify that received materials meet national standards and purchasing requirements, that materials are handled and installed in ways that prevent damage, and that joining of materials meet standards of acceptability for ensuring sound joints. Operators should have effective processes, which systematically evaluate and document all aspects during construction to ensure they achieve the quality of installations they expect and that their installation standards require.

The federal requirements relating to construction of distribution pipelines are in:

- 49CFR192 Subpart G General Construction Requirements for Mains- sections 192.301-192.327
- 49CFR192, Subpart E Welding of Steel in Pipelines sections 192.221-192.245
- Subpart F Joining of Materials Other Than by Welding sections 192.281-192.287

- Subpart H Customer Meters, Service Regulators, and Service Lines sections 192.351-192.371, 192.375, 192.381-192.383
- Subpart J Test Requirements.

Illinois Law adopted 49CFR Part 192 as its minimum safety standards.<sup>128</sup> Illinois law also specifies standards for the location of gas meters and meter inspection at the time of installation.<sup>129</sup>

The objectives of Liberty's evaluation of Peoples Gas' construction program were to determine whether:

- Peoples Gas' engineering design, construction standards, specifications, and practices meet or exceed the requirements contained in federal and state requirements
- Peoples Gas follows its construction standards, specifications, and procedures
- Peoples Gas employs effective construction and management oversight of its construction activities
- Peoples Gas' construction program employs modern technology and industry best practices.

## **B. Findings and Analysis**

### **1. Construction Organization**

A General Manager heads Peoples Gas' construction organization. He reports to the Vice President of Field Operations.<sup>130</sup> The General Manager is primarily responsible for contractors installing mains and services, major construction projects, and pavement restoration.

A Supervisory Engineer of Contractor Services is responsible for projects constructed by main installation contractors. Construction Technicians located within each of the three field districts inspect contractor projects within their district's geographic area. General Supervisors, reporting to the Manager of New Services, have Construction Coordinators that inspect contractor crews installing new services.

Within each district's field operations under the direction of General Supervisors, construction crews also construct mains and service lines, including main replacement and pressure upgrade (low-pressure to medium pressure) projects.

Peoples Gas' Field Operations recently changed its construction organization. Prior to the spring of 2007, each district had a Construction Manager reporting to the General Manager of Construction. The Construction Manager also functioned as the "assistant District Manager." This has changed as of May 2007. The Construction Manager title no longer reports to the General

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<sup>128</sup> Title 83, Chapter I, Subchapter D, Section 590.10 adopted 49 CFR 191.23, 192, 193, and 199 as of January 1, 2003.

<sup>129</sup> Title 83, Chapter I, Subchapter D, Section 590.170 and 500.250, respectively.

<sup>130</sup> Response to Data Request # 10.

Manager of Construction. In its investigation, which it conducted during the transition period, Liberty found that Peoples had not clearly defined the new construction title functions. This confused Peoples Gas' construction personnel as to their job tasks and reporting responsibilities. During interviews of the General Manager of Construction and District Construction Managers, managers indicated that they were unaware of activities within their job descriptions.<sup>131</sup>

Peoples Gas' job descriptions for the General Manager of Construction and District Construction Manager positions were very general in nature and did not identify specific activities. For example, the Job Summary for the General Manager stated:<sup>132</sup>

*Provide strategic and operational leadership for the Construction and New Service groups. Develop and implement company strategies, policies and procedures relating to all aspects of field construction and support activities such as gas main and service pipe installation and replacement , meter and regulator installation, regulator vault replacement, permitting, paving and restoration , and other Distribution system infrastructure improvement work. Establish departmental metrics and other productivity/quality assessment measures.*

For the District Construction Manager, the Job Summary stated:<sup>133</sup>

*Responsible for consistent, efficient and effective construction operations within a field district at Peoples Gas or at North Shore Gas. Provide primary leadership for all field employees assigned to construction activities, to include coaching, staffing, district business planning, budgeting and process improvement to ensure process outputs meet established gas operations service levels. District operations typically span more than one shop location. Responsible for managing applicable stakeholder relationships within a district. This position is a member of the Construction leadership.*

Those job descriptions were not helpful in identifying what specifically Peoples Gas expected of these construction positions.

The Construction Inspector position oversees contractor crews installing new and replacement mains. They were unaware of their job description; there does not appear to be a job description for that position.

## **2. Construction Standards and Contract Requirements**

Peoples Gas has construction procedures and standards in its "Design Manual,"<sup>134</sup> engineering and construction standards and practices in its O&M Manual,<sup>135</sup> and construction contract requirements in "Part IV Engineering Specifications (Revised 10-25-07)."<sup>136</sup> Peoples Gas

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<sup>131</sup> Interviews with General Manager of Construction September 17, 2007, and District Managers Construction, September 18, 2007, September 20, 2007, and June 7, 2007.

<sup>132</sup> Response to Data Request #108.

<sup>133</sup> Response to Data Request #108.

<sup>134</sup> Response to Data Request # 9, Initial Meeting between PGL, ICC, and Liberty conducted May 10, 2007.

<sup>135</sup> Responses to Data Requests #1 and #2.

<sup>136</sup> Response to Data Request # 161.

developed these standards and procedures to comply with federal safety construction requirements for design and installation of its mains and services. Liberty found that Peoples Gas' written construction procedures, standards, and practices were clear, comprehensive, and consistent with federal code requirements.

The document Part IV Engineering Specifications (Revised 10-25-07) lacked a Peoples Gas letterhead, document number, or numbered engineering specification. The contract requirements contained within this document generally appeared to address code requirements but lacked specific reference to Peoples Gas' specifications or standards, other than reference to "General Detail Drawing(s)." For example:

- Within Section 9, minimum required depth of cover for direct burial of plastic pipe is 42 inches. However, there is no reference to Peoples Gas' standard or its requirement of 36 inches of clearance from sources of heat from steam lines.
- Concerning clearance between utilities under Section 2, there is a general statement, "When the pipeline is installed close to any gas or water service, a layer of rock shield shall be placed between the pipeline and said utility." This type of requirement should reference a more detailed standard for clearance and the type of installation expected when construction cannot avoid inadequate clearances.
- Requirements for "Field Bending" of pipe within Section 5 state, "All bend installations shall be subject to the approval of Company's Engineer." However, the document does not reference a specific bending standard.
- Within cathodic protection, Section 6, the document does not reference Peoples Gas' standards for applying pipe wrap, tape, and primer.
- Section 8 regarding testing of mains does not refer to any standard or specification.
- Section 9, Plastic Pipe Installation, does not contain reference to joining procedures or for Peoples Gas' requirements for heat-fusion equipment checks.
- Within subsection D, Joining of Plastic Pipe, wording appears to be tutorial in nature rather than contract requirements.

### **3. Construction Inspection**

Liberty conducted field inspections of contractor and Peoples Gas' crew construction worksites during the period June 2007 through April 2008 to determine the quality of construction, compliance with code, and the nature of Peoples Gas' inspection and oversight of crews and contractors to meet all construction standards and specifications. Specific construction activities observed included:

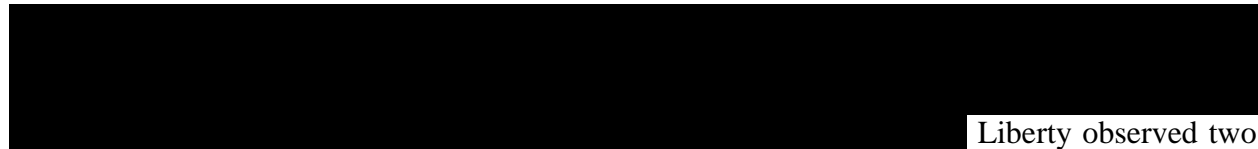
- Installation of mains and services
- Conversion of low pressure systems to high pressure
- Repairs to Peoples Gas' facilities

At the Technical Training Center, Liberty evaluated Peoples Gas' methods for qualifying welding procedures and plastic joining procedures, and for qualifying welders and fustiliers.

Generally, the construction practices observed met code requirements. There were some minor problems such as marginal acceptable cover and some stones found in the bottom of the trench. During construction site visits in 2008 with new contractors, Liberty found the quality of construction and the job sites visited to be of high quality and meeting code requirements.

Regarding contractor inspection oversight, Peoples Gas' construction inspectors do not employ a systematic, comprehensive approach to inspecting new construction installations that ensures that it evaluates all construction code requirements. As a result, code requirements that require inspection of each main to ensure its construction is in accordance with the requirements of 49 CFR Part 192 are not being met.<sup>137</sup> Peoples Gas should employ a checklist that lists construction code requirements. Construction inspectors would then be more likely to inspect for and document their inspection activities concerning relevant requirements when visiting jobsites.

Liberty observed that a Construction Inspector (construction technician)<sup>138</sup> in any one of Peoples Gas' three geographic districts might cover up to five construction projects during a workday. During July 2007, there were 13 to 14 contractor crews working at Peoples Gas within the three districts. At peak construction levels, there may be as many as 15 or 16 contractor construction crews working. This number of construction sites to inspect challenges Peoples Gas' ability to inspect for code compliance.



Liberty observed two different contractors during April 2008 field inspections. On each of these projects, one a 24-inch diameter pipe relocation, and one directional drilling of a 4-inch PE main that included removing a regulator station and a conversion of low pressure to medium pressure, Peoples Gas had assigned a retired Peoples Gas employee as a construction inspector.

Peoples Gas has a number of construction requirements intended to produce sound plastic fusion joints:<sup>139</sup>

- Fusiliers are required to inspect equipment on a daily basis and immediately remove from service any equipment that fails an inspection.
- Peoples Gas' inspectors (Supervisors, Crew Leaders, Construction Inspectors, and Technicians) are required to inspect all fusion equipment at the start of each project and on a weekly basis for the duration of the project.
- Inspectors are required to verify proper surface temperature of heating plates on a daily basis with a surface probe.

Contractor inspectors are responsible for maintaining records on all contractor fusion equipment.

On all projects involving polyethylene pipe, the inspector is to ensure that crews follow proper fusion procedures and that the fusilier has visually inspected all fusion joints. They are to cut out

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<sup>137</sup> See code requirement 49CFR §192.305.

<sup>138</sup> Interview #5 North District Construction Manager, July 17, 2007.

<sup>139</sup> Response to Data Request #2, Main Work Order 9.100, Section VII.



any joint that fails the initial inspection. The inspector is also to perform random visual inspections and immediately send joints failing this visual inspection to Technical Training and Standards for inspection and testing.

While those requirements are helpful, a best practice that Peoples Gas does not employ would be to cut out a joint at the beginning of each day's work and destructively testing that joint to ensure proper working condition of equipment and quality of plastic joints.

Peoples Gas incorporates several best practices in its construction activities:

- Main Work Order 1.000, requires 36 inches of clearance for polyethylene from heat sources to prevent temperatures from exceeding 100 degrees F, and requires 12 inches clearance for mains from foreign structures. The federal code does not specify clearance requirements for distribution mains.
- Peoples Gas' operator qualification program applies to new construction activities as well as operations and maintenance functions. The minimum federal requirements for operator qualifications only apply to operating and maintenance activities.
- Peoples Gas qualifies its personnel performing construction installations every three years. Federal requirements do not address construction operator-qualification requirements.
- Peoples Gas requires rock-free backfill.

Peoples Gas does not have a system that provides its contractor inspectors a means to determine readily the qualifications of individuals performing covered tasks on job sites. As a result, Peoples Gas inspectors do not systematically verify personnel qualifications.

On one project, Liberty questioned Peoples Gas' construction inspector whether the welders were qualified, had welded with the process within the previous 7½ months to maintain their qualifications, and whether the process being used on the job site met the job welding specifications. The construction inspector had not verified the welders' qualifications. On another project, the construction supervisor was not aware that the horizontal directional drilling (HDD) operator was or needed to be qualified.

After Liberty's inquiry, the tracking of welder qualification and procedure was resolved only after a few phone discussions verified welder qualifications. The welders had a Peoples Gas welding handbook dated August 2003, and the Peoples Gas inspector had a July 1996 handbook. The HDD operator had a card that contained the dates of his qualification. A means is necessary for Peoples Gas construction inspectors to check readily the records remotely for qualification verification.

Peoples Gas established the Compliance Monitoring Group (CMG) in June 2006.<sup>140</sup> One objective for CMG was to identify code deficiencies and get Peoples Gas to institute changes and thereby ensure compliance with code requirements. The CMG group implemented new QA/QC (quality assurance / quality control) audits, which captured and documented results of their audits

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<sup>140</sup> Interview conducted November 13, 2007.

in a database beginning April 19, 2007. The program included a requirement that Peoples Gas audit its contractor construction installation crews with a frequency of one audit per quarter for each contractor work activity.

The QC/QA database indicates that Peoples Gas' construction personnel performed only four inspections of crews involving contractor-service installation work during one quarter for May and June 2007. Peoples Gas' construction personnel did not perform any audits of its main installation contractor crews during the year 2007.

## **C. Conclusions**

### **1. Peoples Gas' construction managers and technicians were unaware of the requirements of their formal job descriptions. The descriptions were very general in nature.** (Recommendation IV-1)

During interviews of the General Manager of Construction and District Construction Managers, managers were unaware of activities within their job descriptions. Liberty reviewed Peoples Gas' job descriptions for the General Manager of Construction and District Construction Manager positions, and found the wording of the job descriptions was general in nature and did not identify specific activities.

### **2. Some engineering specifications are incomplete.** (Recommendation IV-2)

Peoples Gas' document, Part IV Engineering Specifications (Revised 10-25-07), lacks a letterhead, document number, or numbered engineering specification. Contract requirements contained within this document generally appeared to address code requirements but lacked specific reference to Peoples Gas' specifications or standards.

### **3. Peoples Gas' construction inspectors do not use checklists.** (Recommendation IV-3)

Resulting from not using checklists, the inspectors do not evaluate systematically and comprehensively contractor construction crews' quality of work or compliance with Peoples Gas' construction standards and procedures. Therefore, construction inspections do not ensure all construction code requirements are evaluated, and code requirements, which require that each main be inspected to ensure it is constructed in accordance with the requirements of 49 CFR Part 192, are not being met.<sup>141</sup>

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<sup>141</sup> See code requirement 49CFR §192.305

**4. Construction inspectors' responsibilities for a number of contractor construction projects at the same time detract from their performance.** (Recommendation IV-4)

A construction inspector (construction technician)<sup>142</sup> in any one of the three geographic districts may cover up to five construction projects during the day. Construction technicians verify that contractor crews comply with contract requirements and company procedures. During July 2007, there were 13 to 14 contractor crews working at Peoples Gas within the three shops. At peak construction levels, there may be as many as 15 to 16 contractor construction crews working. This is too heavy a workload to allow for complete and comprehensive evaluations.

**5. Construction specifications are clear, comprehensive, and contain a number of best practices.**

Liberty found that Peoples Gas' construction standards and specifications were generally of good quality. There were several best practices implemented by these documents.

**6. Peoples Gas has several requirements intended to ensure sound plastic fusion joints. The company could implement a best practice in this area.** (Recommendation IV-5)

A best practice that Peoples Gas should implement is to cut out a joint at the beginning of each day's work and destructively test that joint to ensure proper working condition of equipment and the quality of plastic joints.

**7. Peoples Gas does not systematically verify contractor personnel qualifications.** (Recommendation IV-6)

Peoples Gas does not have a system that provides its contractor inspectors a means to determine readily the qualifications of individuals performing covered tasks on job sites. As a result, inspectors do not systematically verify those qualifications.

**8. Peoples Gas has not been conducting the required audits of its construction contracting crews in accordance with its Compliance Monitoring Group requirements.** (Recommendation IV-7)

Peoples Gas established the Compliance Monitoring Group (CMG) in June 2006. One objective for CMG was to identify code deficiencies and get Peoples Gas to institute changes to ensure compliance with code requirements. The program included a requirement that Peoples Gas audit its contractor construction installation crews with a frequency of one audit per quarter for each contractor work activity. However, Peoples Gas' construction personnel performed only four inspections of crews involving contractor service installations work during one quarter for May and June 2007. Peoples Gas' construction personnel did not perform any audits of its main installation contractor crews during the year 2007.

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<sup>142</sup> Interview #5 North District Construction Manager, July 17, 2007

## **D. Recommendations**

### **IV-1 Develop specific and comprehensive job descriptions.**

The positions of General Manager of Construction, Construction Manager, and Construction Technician do not have job descriptions, so incumbents are aware of their job duties and responsibilities. Peoples Gas should implement this recommendation within six months of the date of this report.

### **IV-2 Review and formalize contractor requirements documents.**

Part IV Engineering Specifications (Revised 10-25-07), should include a Peoples Gas letterhead and a document number or numbered engineering specification. Furthermore, documents containing contract requirements should have specific reference to appropriate Peoples' specifications or standards, other than just reference to "General Detail Drawing(s)." Peoples Gas should implement this recommendation within six months of the date of this report.

### **IV-3 Develop detailed construction inspection checklists for construction inspectors.**

Inspectors need detailed checklists to enable them to evaluate systematically and comprehensively contractor construction crews' quality of work and compliance with Peoples Gas' construction standards and procedures. Peoples Gas should implement this recommendation within nine months of the date of this report.

### **IV-4 Re-evaluate and justify the number of contractor construction projects assigned to its Construction Technicians.**

To ensure their ability to perform comprehensive evaluations of contractors' code compliance at each construction site, Peoples Gas should reduce construction technicians' workloads to allow them to focus on a manageable number of projects. Peoples Gas should implement this recommendation within six months of the date of this report.

### **IV-5 Require contracting crews to cut out and destructively test the first fusion joint of each day's work.**

To ensure sound plastic fusion joints, Peoples Gas needs to implement the best practice of requiring contractors performing fusion joints to verify the quality of their equipment by cutting out and destructively testing the first fusion joint of the day. Peoples Gas should implement this recommendation within nine months of the date of this report.

### **IV-6 Develop a means to determine the qualifications of individuals performing covered tasks on job sites.**

To assist its personnel in verifying the qualifications of contractor personnel on job sites, Peoples Gas should develop a system to allow its inspectors to examine qualifications while on site. Peoples Gas should implement this recommendation within one year of the date of this report.

**IV-7 Conduct audits of contractor crews as required.**

Peoples Gas should evaluate why it has not been conducting audits of its construction contracting crews in accordance with its Compliance Monitoring Group requirements, and remedy the problem to ensure it completes audits of all its contractor construction crews. Peoples Gas should implement this recommendation within three months of the date of this report.

## **V. Operator Qualification, Quality Assurance, and Documentation**

### **A. Operator Qualification**

#### **1. Background and Objectives**

Investigations of pipeline accidents revealed that human error was a contributing factor to some failures. Three such failures prompted the U.S. National Transportation Safety Board (NTSB) to make explicit recommendations for the training, testing, and qualification of pipeline employees. State regulators, through their National Association of Pipeline Safety Representatives (NAPSR), also made recommendations through a resolution to the Department of Transportation's Office of Pipeline Safety supporting qualifications of pipeline employees. In 1992, Congress passed the Pipeline Safety Act (PSA) that required operators to test workers for qualifications and to certify them to operate and maintain pipeline facilities. The Accountable Pipeline Safety and Partnership Act of 1996 (APSPA) amended the 1992 Act to require (instead of testing and certification) that:

- (a) All individuals who operate and maintain pipeline facilities shall be qualified to operate and maintain the pipeline facilities.
- (b) The qualifications applicable to an individual who operates and maintains a pipeline facility shall address the ability to recognize and react appropriately to abnormal operating conditions that may indicate a dangerous situation or conditions exceeding design limits.
- (c) The operator of a pipeline facility shall ensure that employees who operate and maintain the facility are qualified to operate and maintain the pipeline facilities.

In response to the congressional action, the Office of Pipeline Safety established Operator Qualification ("OQ") requirements through a rulemaking in October 1999, as a non-prescriptive, performance-based regulation.<sup>143</sup> The regulation requires that operators develop and maintain a written qualification program to evaluate an individual's ability to perform covered tasks on pipeline facilities, and to recognize and react to abnormal operating conditions that may occur while performing covered tasks. The goal of OQ is to ensure that pipeline employees have the knowledge, skill, and ability needed to perform their work functions safely and efficiently and to reduce the probability and consequence of incidents caused by human error. In addition to performing routine personnel training, operators should be taking additional steps of formally qualifying employees on the work they perform. By making sure personnel are fully trained and qualified to perform the jobs to which they are assigned, operators will be protecting not only the integrity of their pipeline systems, but also the communities and environment along their pipeline routes. The qualifications of individuals provide an additional and important level of safety.

The rule defines a covered task as one that is performed on a pipeline facility, is an operations or maintenance task, is performed as a requirement of Part 192, and affects the operation or

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<sup>143</sup> "Non-prescriptive" means that the regulations do not set forth specific requirements. "Performance-based" means that the programs are to be based on comparisons and/or benchmarking of good industry practice.

integrity of the pipeline. The rule also required operators to complete the qualification of individuals performing covered tasks by October 28, 2002. Some examples of covered tasks performed on a pipeline facility are:

- Installation of mains/service lines/meters
- Maintaining key valves
- Making field repairs
- Conducting leakage surveys
- Excavating and backfilling
- Tapping/stopping of steel or plastic

OQ is not intended to be a one-time event, but a process that continues for the working lifetime of an individual. After the completion of initial evaluation and qualification, there will be a point in time where re-evaluation and re-qualification is required. Operators must recognize this and designate for each covered task an appropriate time interval for re-qualification. In addition to evaluation for the technical competence to perform adequately a covered task, qualification of the individual must include the ability to recognize and react to abnormal operating conditions. All pipeline operators subject to Part 192 are covered by the OQ Rule and are responsible for ensuring that any employees, contractor employees, subcontractor employees, or any other entity performing covered tasks on their pipeline are qualified in accordance with the rule, or are only allowed to perform those tasks while under the direct observation of someone who is qualified.

The evaluation methods used by operators to determine an individual's ability to perform a covered task may include oral or written examination, and observation of performance on the job. Subsequent qualifications may use different qualification methods than those established for the initial qualification. Operators must establish the frequency of subsequent qualifications for each covered task based on the repetitive nature of the task and the level of risk and complexity. Operators must keep records of personnel qualifications.

On December 17, 2002, the President signed the Pipeline Safety Improvement Act of 2002 (PSIA 2002). Section 13 of PSIA 2002 contained additional OQ program requirements not in the existing regulations, and required that pipeline operators implement them no later than December 17, 2004. Of particular note, Section 13 of PSIA 2002 required that OQ programs provide for periodic re-qualification of pipeline personnel.

In addition, the Pipeline and Hazardous Materials Safety Administration (PHMSA) issued an Advisory Bulletin (ADB-06-01) to operators to reinforce the need for safe excavation practices and recommending that operators integrate the OQ regulations into marking, trenching, and backfilling operations to prevent excavation damage mishaps. PHMSA and its state partners have investigated several incidents on pipeline facilities owned by local distribution companies (LDC) where the LDC did not comply with federal pipeline safety regulations or their own procedures and processes in performing excavation and backfilling.

The objectives for the review reported in this chapter were to determine whether:

- Peoples Gas had a written operator qualification (OQ) program.

- Peoples Gas had clearly identified covered tasks for operations and maintenance activities affecting the integrity of the pipeline and required by the safety regulations.
- The OQ program established and documented the evaluation methods appropriate to each covered task.
- Peoples Gas maintained accurate and complete qualification records for all individuals performing covered tasks (including contractor individuals).
- Procedures clearly indicated how individuals who are not formally qualified to perform a covered task might be allowed to perform one if directed and observed by an individual who is qualified.
- Peoples Gas evaluated an individual if there is reason to believe that the individual's performance of a covered task contributed to an incident or that person is no longer qualified to perform a covered task.
- Peoples Gas communicated changes to procedures, tools, standards, and other elements used by individuals in performing covered tasks to the individuals, including contractor individuals, and how it implemented these changes in the evaluation method(s).
- Peoples Gas established and justified re-evaluation intervals of individuals performing covered tasks.
- Peoples Gas established practices that will evaluate the effectiveness of its OQ program.

## **2. Findings and Analysis**

### **a. Operator Qualification Program**

Federal regulation 49CFR Part 192, subpart N (rule), requires that Peoples Gas meet certain prescriptive requirements for establishing a written qualification program, identifying covered task, and qualifying individuals to perform the identified covered tasks. Peoples Gas established its OQ Plan in February 2001, prior to the April 27, 2001, requirement set forth in the regulation [192.809 (a)].<sup>144</sup>

The OQ Plan describes the processes and procedures Peoples Gas will follow to assure that personnel who perform pipeline safety and integrity related tasks are qualified. The plan includes:

- Definitions of key terms and phrases that may be unique to Peoples Gas' Plan
- A listing and description of covered tasks
- The roles and responsibilities of those persons involved in administering and implementing the Plan
- A description of how Plan requirements are communicated to affected parties
- A description of how personnel are to be evaluated, evaluation criteria, evaluation methods, and intervals at which evaluation is required.

The Plan also:

- Addresses performance of covered tasks by individuals who are not qualified

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<sup>144</sup> Response to Data Request #6.



- Provides for an evaluation if there is reason to believe an individual's performance of covered task could have contributed to an incident
- Provides for an evaluation if there is reason to believe that an individual is no longer qualified to perform a covered task and changes affecting covered tasks
- Gives reasons for suspension of qualification of individuals
- Describes the use of contractors and mutual assistance and individuals from other entities who may perform covered tasks on Peoples Gas' pipeline system
- Addresses documentation and recordkeeping.

Peoples Gas added to its Plan the State of Illinois requirement for gas system operators to develop procedures to assure the proper training of its field employees engaged in construction, operations, inspection, and maintenance of the gas system.<sup>145</sup>

### **b. Identification of Covered Tasks**

Covered tasks are those tasks that meet the four-part test set forth in Part 192.801. Each covered task listed is an activity that:

- Is performed on a pipeline facility
- Is an operations or maintenance task
- Is performed as a requirement of Part 192
- Affects the operation or integrity of the pipeline.

To develop the list of covered tasks, each Peoples Gas department identified tasks based on normal work activities that it performed on the company's pipeline facilities. The Code Compliance Section then applied the four-part test to all identified tasks to determine which Peoples Gas would consider covered.

Technical Training and Standards (Technical Training) coordinated the identification of covered tasks and a periodic review with the departments. Additionally, the Distribution and Field Service departments identified certain covered tasks as requiring employee competency based on the employee's classification, rather than just the tasks to which the employee was assigned. Those are referred to as *Core Covered Tasks*, for which all employees within the job classification must be qualified. Appendix A of the plan lists these core covered tasks. The job classifications of crew leaders, gas mechanic (after 4 years), and welders had the requirement of the majority of core covered tasks for the Distribution Department. Peoples Gas identified a final list of covered tasks and department management designed a guide, in the form of tables, to work to link covered tasks to employee classifications. Appendix A of the Plan also includes those tables, which are labeled *Distribution Covered Task/Title Listing*.

TTS and participating department management also evaluated each covered task to identify abnormal operating conditions that workers may encounter while performing the task. Peoples

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<sup>145</sup> 83 Illinois Administrative Code, Chapter I, Subchapter d, Part 520.

Gas has a policy that requires all field employees who perform a covered task to be trained and qualified in recognizing and reacting to all nine of the identified abnormal operating conditions.

The language in the above four-part test refers only to operations or maintenance tasks. However, Peoples Gas included new construction in its covered task list, which is not specifically part of the requirements. There are numerous operators across the country that have chosen only to qualify their employees relative to operations and maintenance just to meet the letter of the law, without consideration to qualification for new construction activities. Federal and state regulators along with Peoples Gas agree there should be no differentiation on type of activity. Liberty commends Peoples Gas for adopting an industry best practice of including qualifications for new construction activities.

### **c. Evaluation Methods for Covered Tasks**

#### *1. Training*

Certain provisions of Section 13 of PSIA 2002 require that pipeline operators modify their existing OQ programs to include a program to provide training, as appropriate, to ensure that individuals performing covered task have the necessary knowledge and skills to perform the tasks in a manner that ensures the safe operation of pipeline facilities. Operators should incorporate training in practices leading to the development and qualification of new employees, as well as in refreshing or expanding the knowledge and skills of individuals with considerable experience. Training is also an appropriate means to allow individuals to maintain the required knowledge and skills to continue performing covered task as they change.

Peoples Gas' Technical Training and Standards (TTS) section conducts both classroom and practical application training of company personnel to qualify the employees that perform the following covered tasks on the company's distribution facilities:

- abnormal operating conditions
- leak investigation/classification
- facility locating and marking
- inside safety inspection
- leak surveys
- main installation
- main retirement/abandonment
- service pipe installation/renewal
- service pipe LP/MP conversion
- service pipe retirement
- meter/regulator installation
- tapping, purging, stopping, gassing
- emergency squeeze off of PE pipe
- backfilling
- external encapsulant installation
- pressure testing

- siphon drip installation
- band clamp installation
- joint makeup (dress, posi, threaded, flange, other)
- anaerobic sealant installation
- corrosion control activities-distribution.

Peoples Gas bases its training of personnel on a 3-year cycle, focusing its efforts on one of its three field districts at a time. Each year a different shop (district) has its personnel retrained and re-qualified. In 2007, Peoples Gas was re-qualifying North Shop personnel, and directed classes at crew leaders and mechanics with 4+ years in grade. Liberty attended and assessed several instruction and training activities for Peoples Gas employees' operator qualification of covered tasks and operator re-qualification at the technical training center.<sup>146</sup> Those classes included:

- Abnormal Operating Conditions (AOC)
- Locating and Marking
- Mains and Services
- Inside Safety Investigations (OA Initial Qualification).

#### **Abnormal Operating Conditions Class**

The Abnormal Operating Condition Class was open to Peoples Gas personnel in all field titles, new Operator Apprentices through General Supervisors and engineers, and for both service and distribution employees. The class began with a lead instructor, who had the title of general supervisor, explaining the grading policy, the importance of training and qualifications, and the importance of safety considerations. Following that introduction, the primary technical instructor, a Senior Engineer, provided an overview of the OQ program, and explained the class objectives and topics to be covered. Peoples Gas devoted the remainder of the class to slide presentations and discussions of covered tasks and examples of abnormal operating conditions.

The Distribution, Field Service and Gas Operations, Operator Qualification Reports lists a description of the covered task, a list of sub-tasks, and a list of abnormal operating conditions. Peoples Gas identified nine examples of abnormal conditions:

1. Unexpected release, ignition or explosion of gas
2. Unplanned pressure increase or decrease
3. Inadequate pipe condition
4. Poorly completed joint
5. Unexpected contents in piping
6. Component malfunction/failure
7. Unexpected condition in premises
8. Illegal connection
9. Damage to company property.

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<sup>146</sup> October 9-12, 2007.

Liberty found that the training material was comprehensive, the instructor's presentation was highly effective, and the classroom discussion and examples were effective. Appendix V-1 of this chapter contains a more detailed description and evaluation of this class.

### **Locating and Marking Class**

The Locating and Marking course provides refresher training and a means to re-qualify Peoples Gas personnel. Course objectives included principles and methods of locating underground facilities, the use of inductive and conductive methods, and instruction on how to mark existing gas lines. A Senior Instructor presented the class. He explained the general configuration of Peoples Gas' mains, locating techniques, the use of the Navigate system and the pre-Navigate Atlas maps, the use of electronic locating devices, tolerance zones, and proper marking techniques.

The instructor was a good communicator and had good instructional skills. However, Liberty identified a number of deficiencies, including an example of improper information imparted (on the subject of tolerance zones) and an inconsistency between guidelines provided to Peoples Gas employees and the City's Excavator Handbook. The instructor was not familiar with the Excavator Handbook and was unaware of the Common Ground Alliance findings on damage prevention. Appendix V-2 of this chapter contains a more detailed description and evaluation of this class. Appendix V-3 of this chapter contains a detailed evaluation of the Facility Locating and Marking Evaluation Form demonstrated in the class and used in the field.

### **Mains and Services Class**

The classroom sessions of the Mains and Services class covered main work such as tapping, purging, stopping, gassing, main installation, main retirement, and backfilling. Service pipe work included service type installation and renewal, meter and regulator installation, and pressure testing. The sessions also covered inside safety inspections (ISI), and anaerobic sealant and squeeze off tool procedures.

The classroom material consisted of handouts that essentially followed a slide presentation. On numerous occasions, the instructor referenced Peoples Gas' procedures, but with very little reference to federal and state regulations. The Instructor was able to communicate the majority of the material, but there were several areas that needed more clarification or detail than he was able to provide.

### **Inside Safety Inspections Class**

The Inside Safety Inspections (ISIs) class was for Operations Apprentices. The U.S. DOT requires ISIs, which are in addition to investigations of reported leaks, surveys, and tests that Peoples Gas routinely conducts. If Gas Operations employees enter a building where there is a meter or meters installed inside, an ISI is mandatory and the inspector must complete an ISI form 8031 or computer-generated ISI ticket. Peoples Gas performs an ISI in business districts annually and residential ISIs every three years. The class included procedures for checking various conditions (*e.g.*, leaks, corrosion, pipe supports), a visual inspection, and an atmospheric survey.

The instructor was effective, and presented and reinforced the material thoroughly. However, the class addressed only atmospheric conditions; it did not address corrosion adequately. Appendix V-4 of this chapter contains a more detailed description and evaluation of this class.

## 2. *Evaluation of Qualifications*

Peoples Gas requires a passing grade of 75 percent for all courses except corrosion, for which it requires a passing grade of 85 percent. Gas mechanics and higher-level positions have three attempts to pass. The first failure requires the employee to retest within 90 days, and the second failure requires a retest after 30 days. If the employee fails the third retest, the company has the option to downgrade the employee or terminate employment.

The evaluation of qualifications section of Peoples Gas' OQ plan includes an individual's ability to: perform a covered task and to recognize and react to abnormal operating conditions that the individual may encounter during the performance of each covered task for which the individual is qualified. The evaluation process may include any or a combination of the following evaluation methods:

- Written examination
- Oral examination
- Work performance history review
- Observation during performance on the job, on-the-job training
- Simulations and other forms of assessment.

Therefore, Peoples Gas' process could allow it to use a written examination as the only evaluation method to ascertain an individual's knowledge, skills, and ability.

A good program would evaluate knowledge using a written evaluation or oral interview, skills using performance evaluation, and ability using an evaluation for knowledge and skills. However, as an example, Peoples Gas training for leak surveys contains an 8-hour class with a written multiple-choice test and no practical examination. It is unlikely that it could ensure that an individual has the ability solely through a written examination without a practical evaluation.

Peoples Gas OQ program states in section 5.2 that it will use primarily:

1. Written test after classroom training or refresher courses
2. Field evaluation while the employee is performing a regular assigned job
3. Observation in the TTS or department practical room.

Peoples Gas should re-evaluate their covered tasks to include practical evaluation to critical tasks such as leak surveys and revise the Distribution Covered Task Evaluation Technique in Appendix A of the OQ Program to reflect the changes. Peoples Gas also includes "work performance history review" as an evaluation method. The industry typically does not use this method because it is not cost effective.

For each class, there was a written test given to each student. After the test, the instructor went through each test question identifying the correct answer. In some cases, the student was not sure whether he answered correctly. The instructor emphasized what the answers should be and made sure the employee understood. In some tests, there was too much emphasis in a certain area that

made up a large percentage of the test questions, instead of focusing on a broader scale of knowledge required for a particular covered task.

Liberty observed the practical test for the Mains and Services class. At each of 12 main and 7 service workstations, the class required the employee to select the appropriate materials and demonstrate his ability to complete a covered task. The employee had eight hours to complete all of the workstations. During this process, the instructor asked critical questions to ascertain the knowledge of the employee, an important part of evaluating the employee and verifying the employee's knowledge of the task. After the employee finished his work at the station, the instructor reviewed the completed task while the employee described how he completed his task step-by-step. The instructor then evaluated the performance of the employee with a "pass or fail" and the employee rotated to the next workstation. Therefore, in addition to demonstrating the knowledge and ability to complete the tasks, it was important that the employee manage his time in order to complete all the tasks. Appendix V-5 to this chapter provides a more complete description of this test.

### 3. *Peoples Gas' Instructors*

Peoples Gas provided the job descriptions, including all training and non-training responsibilities, for the various instructors that Liberty observed.<sup>147</sup> The majority of the instructors had numerous non-training responsibilities that took time away from their training responsibilities. For example, the following is a list of non-training responsibilities for one instructor, a Senior Engineer:

- Mine sweeps
- Calibrate and repair mechanical Pressure recorders
- Maintain Pressure recorder Access Database
- Repair and build new burn bags
- Repair and build new Chicago Test Bag
- Goldak Model 902 M-Scopes, TR 5A, Metro-Tech
- Optical Methane detection installation and repair
- Kulhman test gauge
- Repair mechanical fusion equipment
- Coupon analysis
- Calibration of odorization equipment
- Conduct weekly Odorometer test at Central Shop
- Hydrostatic testing
- Ground Penetrating Radar research
- Maintain Master Training Document File System
- Product research and testing (Ground Penetrating Radar)
- Maintain wipe sample database using Microsoft Excel Spreadsheet

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<sup>147</sup> Response to Data Request #123.

- Track Odorometer Sampling at North, South, Central and Downtown location
- Liquid PCB composite sample collection from Crawford Station
- Maintain gas odor surveys maps for North, South, and Central location
- Assist others with projects as needed.

These types of duties expected of instructional staff keep the instructors from preparing for classroom instruction duties, evaluating potential revisions to training and Standard Operating Procedures based on feedback and input from students, seminars, and rulemakings. Liberty concluded that those activities prevented instructors from maintaining or strengthening their expertise in the subject areas, and prevented them from focusing on improving and modifying training course content.

#### **d. Qualification Records for Covered Tasks**

Prior to 2004, Peoples Gas maintained its OQ records with “Brent-Trak” records. In 2004, Peoples Gas changed to a new system from PeopleSoft, and now maintains OQ information within a PeopleSoft database. Management can access those records electronically. Any records review or individual qualification verification of a covered task by an ICC inspector has to occur at the Technical Training Center.

Liberty reviewed a random sample of calendar-year 2006 OQ testing records. Liberty assessed various test records such as leaks survey/valve inspection, initial OQ locating and marking, abnormal operating conditions, and inside safety inspections to determine documentation of results and to learn whether Technical Training had follow-up communication to the shops with regard to OQ covered task failures. Liberty also reviewed records of various individuals identified from field activities to verify covered task qualifications.

Technical Training reviews Operator Qualification Plans of contractors to ensure that contractor individuals are qualified in accordance with Peoples Gas’ OQ plan. Peoples Gas has approved the Midwest Energy Association (MEA) covered tasks and evaluations for performing select Peoples Gas covered tasks. Contractor OQ programs are reviewed to ascertain the programs are consistent with Peoples Gas requirements as detailed in the “Contractor Operator Qualification Requirements When Performing Work for Peoples Gas and NSG.” Peoples Gas contracted with additional contractors and will be using three for 2008.

- [REDACTED] has installed mains and services in previous years
- [REDACTED] had performed some corrosion work and will also be doing new services
- [REDACTED] is new to Peoples Gas in Chicago and will be installing mains and services.

Peoples Gas has changed its policy in regards to training of contractor personnel for operator qualifications. Previously, personnel had to be trained by [REDACTED] and qualified under the Midwest Energy Association (MEA) program. Under Peoples Gas’ new policy, contractors may use internal training other than [REDACTED] provided trainers are MEA-trained. Technical Training has reviewed and approved [REDACTED]’s OQ Plan, which Liberty reviewed. Liberty requested to review the OQ Plans of two contractors, [REDACTED] and [REDACTED], but TTS was only able to produce

█'s Plan.<sup>148</sup> The OQ Plan or evidence of approved qualification for contractors should be readily available. Liberty reviewed █'s plan and found it to be consistent with Peoples Gas requirements. Liberty also reviewed the █ Contractor Qualification Report, which listed 51 covered tasks and 28 █ employees and their respective qualification dates.

**e. Evaluation of No-Longer-Qualified Individuals**

Peoples Gas stated that when an employee fails an OQ test, Technical Training would send a Failure Report to the respective shop notifying them that the employee can no longer perform that particular task(s). The employee has 90 days for re-testing. If he fails the retest, re-testing must occur again within 30 days. If he fails a third time, Peoples Gas can either downgrade the employee or terminate employment. All the covered task failures that Liberty reviewed had documentation to the applicable shops notifying them not to allow that particular employee to perform that task unless directly supervised.

When an employee fails an OQ test, prior to retest the individual is instructed, normally one-on-one, on the covered task. On the retest, he is tested on the entire covered task, not just on what he previously got wrong. After the employee passes a retest, Technical Training will send an e-mail stating that person is qualified to perform their tasks.

Liberty reviewed the e-mails and OQ Distribution Failure Reports for the North Shop in 2007. There were nine failures involving crew leaders, of which four indicated the problem as “no concept.”<sup>149</sup> This is very troubling, considering these were OQ *requalifications* and that a crew leader has a minimum of ten years experience and is responsible for overseeing (observing) his crew. In addition, there were 20 failures involving a gas mechanic, of which 10 indicated the problem as “no concept.”

In addition, Liberty conducted a review of the South Shop OQ failures for 2006. That shop had approximately 70 OQ test failures. There were ten failures involving gas mechanics that indicated the problem as “no concept.” Again, this is a troubling number considering this is an OQ re-qualification.

**f. Programmatic Changes**

As a result of several construction-related incidents that caused damage to underground pipeline facilities, some of which resulted in deaths, injuries, property damage, and disruption to communities, PHMSA issued two Advisory Bulletins to pipeline operators in 2006. Advisory Bulletin 06-01 specifically called on operators to ensure that individuals critical to damage prevention at construction sites are qualified to perform the necessary safety tasks, including one call notifications, line locating and marking, and inspection of the construction activities. In Advisory Bulletin ADB-06-03, PHMSA emphasized the importance of accurately locating and marking underground pipelines before construction-related excavation activities commence near the pipelines, and urged operators to follow the best practices on damage prevention found in the

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<sup>148</sup> Response to Data Request #45.

<sup>149</sup> “No Concept” was the Peoples Gas’ instructor’s term meaning that the individual had no basic understanding.



Common Ground Study. PHMSA also advised pipeline operators to take the following damage prevention measures:

- Make sure that individuals locating and marking the pipelines have the knowledge, skills, and abilities.
- Make sure that individuals locating and marking the pipelines are familiar with state and local requirements on marking.
- Use qualified personnel for locating and marking pipelines. At a minimum, they should have received appropriate training such as that outlined in the National Utility Locating Contractors Association locator training standards and practices.
- Follow the best practices on locating and marking pipelines developed by the Common Ground Alliance.

Peoples Gas is deficient in responding to PHMSA's Advisory Bulletins. Liberty found no indication that the Senior Engineer/Instructor identified above had any training in the areas of responsibility such as line locating and marking, and leak investigation and classification within the last eight years.

#### **g. Requalification**

Section 13 of PSIA 2002 requires pipeline operators to modify their existing OQ programs to include a periodic requalification component. The requalification intervals established by Peoples Gas must reflect the relevant factors including the difficulty, importance, and frequency of performance of the task, and be justified by appropriate documentation. Federal regulations CFR Part 192.805(g),(h) requires Peoples Gas to identify covered tasks and the intervals at which evaluation of individuals qualification is needed, and to provide training, as appropriate, to ensure individuals have the necessary knowledge and skills to perform the tasks to ensure the safe operation of Peoples Gas facilities.

Liberty observed a one-day refresher course for distribution personnel called "Corrosion Control Activities for Distribution, Corrosion Basics, and Cathodic Protection Fundamentals." This class qualifies personnel to take a reading with a voltmeter. Essentially, distribution personnel passing this course will be qualified for installing a Thermite weld for test leads and anode installation, and for coating and wrapping pipe. The instructor stressed that students (distribution personnel) taking these readings are not taking the official corrosion reads that an Operations Apprentice (OA) or corrosion technician would enter into Navigate. For that task, an OA typically would spend five field days of training with another OA before taking corrosion reads on his own.

The classroom material consisted of handouts that essentially followed slide presentations. Numerous times the instructor referenced Peoples Gas' procedures, and reflected in field situations. The course covered what corrosion was, how a corrosion cell worked, what a copper sulfate reference cell is, the purpose of sacrificial anodes, what cathodic protection is, and how to reduce or mitigate corrosion on mains and services. Liberty noted that the instructor was very capable, knowledgeable, and able to communicate effectively to the employees.

### **3. Conclusions**

#### **1. Peoples Gas has an acceptable written Operator Qualification (OQ) Plan.**

Peoples Gas' OQ Plan meets the requirements of Federal regulations and is consistent with the intent of the regulatory language. It includes new construction as one of the covered tasks. Peoples Gas' Core Covered Task requirement and identification of abnormal operating conditions provide an additional and important level of safety. Training in identification of all abnormal operating conditions, not just for the abnormal operating conditions for the specific covered task provides an additional and important level of safety.

#### **2. Liberty's evaluation of Peoples Gas' training classes yielded mixed results.** (Recommendations V-1 and V-2)

For the Abnormal Operating Conditions class, the training material was comprehensive; the instructor's presentation was highly effective, and signs, classroom discussion, and examples were effective.

In the Locating and Marking, Liberty found the instructor to be a good communicator with good instructional skills, but there were deficiencies associated with his limited knowledge of the subject material and the material presented.

In the Mains and Services class, the instructor referenced Peoples Gas' procedures, but made very little reference to federal and state regulations. The instructor was able to communicate the majority of the material, but was unable to provide more clarification or detail in several areas.

Peoples Gas did not provide training in some tasks that personnel rarely perform. As an example, in the Mains and Services class, there was no training provided with respect to procedures, repairs, or reconnects for clear plastic pipe, even though Peoples Gas has some of that pipe on its system.

In the Inside Safety Inspection class, Liberty found the instructor to be an effective instructor who presented and reinforced the instructional material thoroughly.

For the Corrosion Control refresher course, Liberty found the instructor to be capable, knowledgeable, and able to communicate effectively to the employees.

#### **3. Some training instructors had too many other responsibilities or too little experience.** (Recommendations V-1 and V-2)

Instructors must have time to attend training courses to maintain and improve their knowledge of subject-area work activity. Instructors must also have time to conduct field observations of subject-area work activities and interface with employees in the field. Such knowledge is necessary to strengthen and broaden their understanding and knowledge in their subject areas and maintain their confidence in order to train others. Training courses are readily available and include training seminars, educational and teaching seminars, committees, and meetings. For example, Leak Handling instructors would clearly benefit by attending leak investigation and

emergency response courses provided by Heath Consultants or by others such as TSI, MEA, and other gas safety seminars as well as field observations of actual leak response and leak investigations.

Generally, the number and quality of training sessions attended by instructors were not sufficient. Many instructors have little or no training in the subjects they are instructing. Liberty reviewed a sample of the training taken by training instructors, including the entire training of the Locating and Marking instructor. Liberty found that he had received no training on that subject between January 2002 and September 2007.

**4. Peoples Gas' evaluation methods have several weaknesses.** (Recommendation V-3)

Peoples Gas' evaluation process may use a written examination as the only evaluation method. For example, Peoples Gas' training for leak surveys contains an 8-hour class with a written multiple-choice test and no practical examination. It is unlikely that it could ensure that an individual has the ability solely through a written examination without a practical evaluation.

The work-performance history review evaluation method is not typically used in the industry because it is not cost effective.

Liberty also observed that some tests focused heavily on narrow areas of the subject rather than the broader scale of knowledge required for a particular covered task.

**5. Peoples Gas could not produce the OQ Plan for an approved contractor.** (Recommendation V-4)

The OQ Plan or evidence of approved qualification for contractors should be readily available.

**6. Peoples Gas' evaluation process for administering practical tests is effective in determining employees' abilities to perform covered tasks.**

The overall process of evaluation was very effective in determining the employee's ability to perform each covered task. Instructors were very knowledgeable and capable as they constantly observed the employees and made notes in their evaluations as they progressed through each step of their workstations.

**7. Peoples Gas does not perform an evaluation of OQ requalification test failures.** (Recommendation V-5)

Peoples Gas should perform an analysis to determine in what areas (covered tasks) crew leaders are failing retests. The number of job classifications involving crew leaders who needed a "90 day retest" for failing a distribution covered task is problematic, particularly since the retest report indicated "no concept" (no basic understanding) in many cases. Some crew leaders may concentrate on certain tasks and not perform other tasks often enough to keep their knowledge and skills current. Peoples Gas needs to re-evaluate training intervals due to the infrequent or repetitive nature of performing a covered task identified by the retest analysis.

**8. Peoples Gas' requalification interval is not consistent with industry practices.**

(Recommendation V-6)

Peoples Gas' OQ Plan, Appendix A, shows requalification intervals for each covered task. The maximum interval is three years. In addition, throughout Peoples Gas' O&M Plan, numerous sections state "... employee must re-qualify every three years." However, Liberty found that several employees were past their three years for requalification. Language in the OQ Plan states that, "Subsequent evaluations will be performed before the end of the third (or other as specified in Appendix A) calendar year after the calendar year in which the previous evaluation was successfully completed." Peoples Gas stated this could mean that a person could go as long as three years, eleven months before requalification. The majority of operators use either three years to the day or three years not to exceed 39 months for requalification intervals.

**9. Peoples Gas has not addressed several new training requirements from PHMSA.** (Recommendation V-7)

Peoples Gas is deficient in responding to two recent PHMSA's Advisory Bulletins, both related to excavation damage prevention. One relates to ensuring that individuals critical to damage prevention at construction sites are qualified to perform the necessary safety tasks, including one call notifications, line locating and marking, and inspection of the construction activities. The other emphasizes the importance of accurately locating and marking underground pipelines before construction related excavation activities commence near the pipelines and to urge operators to follow the best practices on damage prevention found in the Common Ground Study. Peoples Gas has not trained its instructors on the new requirements and has not incorporated them into the relevant course curriculum.

## **4. Recommendations**

**V-1 Review and improve the curricula of all training classes.**

Liberty noted several deficiencies in training curricula and materials. Peoples Gas should conduct, or have conducted, a complete review of training curricula and materials. It should complete this review within one year of the date of this report.

**V-2 Review and reduce non-training job duties of instructors.**

The primary duty of the instructors is to instruct. This requires that the instructors take appropriate training themselves, both initially and with regular refresher classes, to become expert in the subjects they teach, and to maintain that expertise on a current basis. As currently configured, their job duties allow no time for their training.

Peoples Gas should conduct this review within six months of the date of this report and complete the implementation of changes within 18 months of the date of this report.

**V-3 Revise the testing methods for evaluations of qualifications to perform covered tasks.**

Peoples Gas should re-evaluate its covered tasks to include practical evaluation of critical tasks such as leak surveys in addition to written tests. Peoples Gas should also remove “work performance history review” as an evaluation method. Peoples Gas should revise the Distribution Covered Task Evaluation Technique in Appendix A of the OQ Program to reflect the above changes. Peoples Gas should also review its written tests to ensure that those tests evaluate the overall knowledge of the subject, rather than concentrating heavily on individual areas. Peoples Gas should implement this recommendation within one year of the date of this report, in conjunction with Recommendation V-1.

**V-4 Ensure that all contractors have acceptable Operator Qualification Plans.**

Peoples Gas should implement this recommendation immediately.

**V-5 Analyze crew leader retest failures.**

Peoples Gas should perform an analysis to determine in what areas (covered tasks) crew leaders are failing retests. Peoples Gas should re-evaluate each of the areas (covered tasks) that might necessitate training more often (less than three years) due to the infrequent or repetitive nature of performing a covered task identified by the retest analysis. Peoples Gas should complete an initial review of such failures within six months of the date of this report and make this analysis a continuing part of the qualification process.

**V-6 Modify requalification interval practices.**

Peoples Gas should change its OQ Plan (Section 5.2 Evaluation of Qualifications, page 8) to require requalification within 3 years or not to exceed 39 months, rather than up to 3 years 11 months as currently allowed. Peoples Gas should implement this change within three months of the date of this report.

**V-7 Address the new Pipeline and Hazardous Materials Safety Administration (PHMSA) training requirements.**

Peoples Gas should train instructors and add to course curricula the new requirements and guidelines contained in the PHMSA Advisory bulletins.

## **Appendix V-1 – Abnormal Operating Conditions Class – Detailed Evaluation**

Liberty observed the training course for the covered task Abnormal Operating Condition (AOC), which Peoples Gas gave to service and distribution employees. There were approximately 23 employees of various job classifications attending, including crew leader, gas mechanic, operations apprentice, street mechanic, engineer, general supervisor, senior service specialist, and EO number one. A general supervisor/lead instructor gave the introduction that covered mainly the grading policy – a passing grade of 75 percent for all courses, except 85 percent for those involved in corrosion. He also emphasized that gas mechanics and above have three attempts to pass. The first failure will require the employee to retest within 90 days, and the second failure will require a retest after 30 days. If the employee fails the third retest, the company has the option to downgrade the employee or terminate employment. The instructor emphasized the importance Peoples Gas places on training and personnel qualifications by being direct and up front with Peoples Gas policies. He stressed that he does not care who you are and will fail you based on your performance. He stressed that what employees do may cause a safety problem, “you must know what you're doing.”

He turned the program over to a Senior Engineer who presented the majority of the material. He started by explaining why the students were here, and periodically mentioned and repeated this for emphasis during the course. Peoples Gas employees must be able to:

- Recognize, react and respond to abnormal operating conditions
- Protect life and property
- Take immediate action in emergencies.

He then explained the objectives of the class and three areas that he will cover:

- Overview of the operator qualification program
- Covered tasks
- Definitions of abnormal operating conditions (AOC).

Overview of the operator qualification program consisted of informing the attendees that the federal government initiated the operator qualification program, Peoples Gas developed the training requirements, and the union is in agreement with it. The class was instructed that the Illinois Commerce Commission conducts audits of all Peoples Gas policies and programs.

The instructor identified 26 covered tasks for distribution and gave examples of these covered tasks. He emphasized that a qualified person must be able to perform a covered task without assistance and be able to react to abnormal operating conditions. He also mentioned that in order to be qualified you must pass a written test, practical test, and a field check which essentially is an on the job evaluation.

The instructor described the nine abnormal operating conditions that Peoples Gas has identified and defined them as a deviation from normal operations. The instructor gave examples of each abnormal operating condition utilizing a slide presentation and reinforced during discussions between instructor and employee for each AOC. Throughout the instruction, questions were used as a “test for understanding” with the attendees. The instructor utilized “review points” with each slide to help with his presentation. The instructor demonstrated interaction of the nine types of

AOCs and how any of these AOCs may lead to the most hazardous AOCs, i.e. unexpected gas release, or unplanned pressure increase or decrease. The classroom contained signs to emphasize the key safety points covered during instruction as well as signs for each of the nine covered tasks. The instructor directed class attention to the nine AOCs by “drilling” the class with examples of “cause” and “effects” cards. Four test formats were used to discourage cheating. After lunch, the instructor reviewed highlights of the morning’s instruction.

Liberty’s observation and evaluation of the AOC class found that:

- The training material was comprehensive
- The training was presented in a highly effective manner
- The instructor did an excellent job in presenting the AOC material
- Effectively utilized signs, classroom discussion, and examples throughout the duration of the course.

The instructor’s ability to ask timely questions covering his slide presentation and getting the employees to interact made this particular class a success. One comment repeatedly made during the course by the employees concerned the number of damaged pipelines caused by the water and sewer department.

It was stated by the instructor that the majority of deficiencies for re-qualification are usually “practical” rather than written “testing.” This may be a result, as well as a concern, that with some job classifications of individuals such as crew leaders who are pigeonholed doing the same type of job repeatedly. This could occur when Peoples Gas elects to use the same employees to perform main type work, while relegating others to work on service type work. This can become an acute problem in attempting to balance overtime; but a crew leader assigned to services who has to work on weekends might find himself in a situation responding to an emergency to perform a covered task they are not accustomed to doing such as installing an external encapsulant.

### **Appendix V-2 – Locating and Marking Class – Detailed Evaluation**

Liberty observed a Locating and Marking course, presented by another Senior Instructor. It is intended to provide refresher training and a means to re-qualify Peoples Gas personnel. Course objectives included principles and methods of locating underground facilities, use of inductive and conductive methods, and how to mark existing gas lines. The instructor explained that most of Peoples Gas mains were located from lot lines, which are usually 12” behind the sidewalk. When the sidewalk area does not have a parkway (the grassy strip inside the curb line in the sidewalk area), an alternate means of locating gas mains are to measure from the center of the street (usually the center of the sewer). The width of the street is indicated within Navigate; ½ of the width of the street measured from the centerline sewer will determine the location of the lot line. Course instruction provided descriptions of screen shots from the Navigate system. The screen shots on Navigate do not show exact measurements of gas mains and service lines at all locations. Atlas maps at times may have more accurate locations of mains in between the “start” point and the “end” point.

“Atlas” maps have not been maintained from the time Navigate went into effect. These maps located within each District Shop, may show a line was retired, but may not show when those lines may have a gas line inserted.

The actual location of Peoples Gas’ gas lines must be determined using an electronic locating device. All Peoples Gas employees are responsible for protecting Peoples Gas’ gas lines. Excavations within 50 feet of a regulator station or near remotely operated valves present an immediate threat due to control lines in the area. Should this be discovered, the employees were instructed to inform a General Supervisor as soon as possible. These situations require continuous monitoring by Peoples Gas.

Employees were told to record and report any discrepancies between company records and actual conditions in the field. The course instructs the employees to tell their supervisor of incorrect information in Navigate so that this information will be corrected.

The instructor described the tolerance zone as 18” on either side of the gas line markings made by a Peoples Gas locator with high visibility yellow paint. This is inconsistent with Peoples Gas written procedures that identifies a tolerance zone as 24” on either side of gas line markings. Excavation within this zone requires hand excavation until clear of the marked facility. Conductive method eliminates signal interference due to direct connection with the gas line.

Small diameter mains and services (up to 10’ in diameter) are marked with a single line over the center of the pipe. Large diameter mains greater than 12” in diameter are marked with a double line, one line over each side of the pipe. Markings are to include the word “GAS,” diameter size, type of material and pressure (LP, MP, HP). “Sufficient” marks must be made to locate gas lines. There was no further discussion as to what was meant by “what is sufficient.” Although the guidelines given to Peoples Gas employees on marking facilities appears to be somewhat consistent with their own procedures, it is inconsistent with the recommendations of standardized utility markings in the City of Chicago stated in the Excavator Handbook published by DIGGER. Liberty noted that the instructor was not familiar with this Handbook and was not aware of the Common Ground Alliance (CGA) whose mission of identifying “best practices” for damage prevention includes locating and marking. Liberty also observed that there was no handout material such as DIGGER’s publication or standard color code cards for marking underground utility lines all of which could be used as reference material in the field.

Although the classroom instructor was a good communicator with excellent instruction skills, Liberty observed that the instructor was not knowledgeable on the subject and there was a need for Peoples Gas to properly “train the trainer.”

### **Appendix V-3 – Facility Locating and Marking Evaluation Form - Detailed Evaluation**

Appendix A of the OQ Plan is entitled *Distribution Covered Task Evaluation Technique* and lists 34 covered tasks and identifies which evaluation process (written, practical and field) will be used for each task. In particular, Liberty noted that the covered task for facility locating and marking only required a written evaluation. However, Liberty had obtained a document entitled



“Facility Locating and Marking Initial Qualification Practical Evaluation Form.” On this form, the task stated: Demonstrate the ability to locate the lot line and accurately locate and mark (emphasis added) gas company facility/facilities. Essentially, there were six steps to evaluate the individual of their ability to locate and mark facilities with a satisfactory or unsatisfactory grading system. These steps were:

1. Student demonstrated the ability to accurately locate gas main using inductive method;
2. Student demonstrated the ability to accurately locate gas main using conductive method;
3. Student demonstrated the ability to accurately locate company service using the inductive method;
4. Student demonstrated the ability to accurately locate company service using the conductive method;
5. Student demonstrated the ability to accurately fine the lot line by measuring ½ street width;
6. Student demonstrates proficient use of other tools or instruments needed to accurately locate company facilities.

As emphasized above, the task specifically states, “... locate and mark...” There is no indication to document that the individual properly marked company facilities according to their standards. Improper/inadequate markings are not only a probable violation of company standards, but more importantly improper/inadequate markings could be confusing or misleading to an excavator resulting in damages to Peoples Gas facilities and possible ignition of gas or injuries. Damage to underground pipelines during excavation has historically been a leading cause of serious incidents, which include fatalities and injuries.

Liberty found this form to be deficient for use as documentation for the practical evaluation of facility locating and marking initial qualification. Peoples Gas should reevaluate this form and consider adding additional “steps” to not only cover “marking,” but also other important areas not addressed such as:

1. Correctly demonstrated the ability to mark the company facilities according to Peoples Gas standards
2. Demonstrated knowledge and understanding for all location documentation practices
3. Demonstrated comprehension of the procedures involved with locating requests
4. Demonstrated proper storage, maintenance and cleaning of the transmitter as per manufacturer and/or Peoples Gas instructions
5. Student identified and uses all personal protective equipment as required by Peoples Gas standards
6. Student demonstrated knowledge of potential hazards
7. Student demonstrated knowledge of the state and local requirements on marking.

Liberty also noted that there was no indication of a practical evaluation for the covered task of leak investigation/classification.

#### **Appendix V-4 – Inside Safety Inspection Class – Detailed Evaluation**

This class is offered for Operations Apprentices, whose duties include performing Inside Service Inspection (ISI).

The instructor indicated that Inside Safety Inspections (ISIs) are required by U.S. DOT and are in addition to investigations of reported leaks, surveys and tests Peoples Gas routinely conducts. If Gas Operations employees enter a building where there is a meter or meters installed inside, an ISI is mandatory; an ISI form 8031 or computer generated ISI ticket shall be completed.

Peoples Gas performs an ISI in business districts annually and residential ISIs every 3 years.

The procedures to perform an ISI include checking for:

- Leaks.
- Atmospheric Corrosion, whether mild (shallow small pits) or severe (deep pits and rust scabs).
- Inadequate pipe support.
- If piping is concealed, the work order shall be noted in remarks.
- An ISI consists of an atmospheric survey with a Combustible Gas Indicator (CGI) not a Flame Ionization Unit (FI), of the gas service line that is exposed or accessible from its point of entry into the building (point A) to the outlet of the meter (point B). The atmospheric survey is a survey of the air along the direct path of the piping from the service entry into the building to the outlet of the meter looking for gas leaks. The instructor identified different scenarios of piping configuration and meter locations to identify an acceptable complete ISI and emphasized documentation.
- At least point A to point B must be accomplished to complete an inspection. If any reading is detected, call the gas condition in. Severe corrosion, inadequate support conditions, or illegal connections discovered, shall be immediately reported to the appropriate company representative.

Liberty observed that the instructor was an excellent effective instructor. He presented and reinforced the instructional material very thoroughly. The class responded enthusiastically to questions. However, inspecting for corrosion was not adequately addressed during the class. The course instruction only addressed atmospheric corrosion. This area should have been reinforced with visual physical examples of pipe sections that had experienced mild and severe corrosion. This would help the employee to understand (see) to what extent corrosion is or is not acceptable. The instructor did utilize photos of pipe corrosion, but that is not as effective as a visual physical example. Additionally, the threat from corrosion at the building's point of entry through the foundation wall, where corrosion is more likely to be a threat and could be the most severe, was not addressed. Pipe at the building foundation wall is more vulnerable to the threat of external corrosion due to changes in oxygen levels, soils, materials, and chemicals leaching from the foundation wall.

### **Appendix V-5 – Mains and Services Examination – Detailed Evaluation**

The evaluation included 19 workstations where the employees would select necessary materials and demonstrate their ability to complete a covered task. The workstations consisted of seven service workstations in accordance with service standards 3.200 and 2.100, and 12 main workstations meeting various work main orders. The employee is given eight hours to complete

all the workstations. Therefore, it is very important that the employee manage his time in order to complete all the tasks.

The service workstations covered:

1. Relocate two inside meters to outside
2. Installation of plastic medium pressure single outside meter set
3. Installation of a plastic medium pressure service off 2-inch steel main with the regulator outside and the meter inside
4. Installation of a plastic medium pressure service off a 6-inch cast-iron main
5. Installation of a 2-inch corrosion protected low-pressure service off a six-inch ductile iron low-pressure main
6. Installation of a plastic low-pressure service off a six-inch ductile iron low-pressure main.

The main workstations covered:

1. Tap main with hole saw
2. Install low-pressure siphon drip
3. Soap and tape broken main
4. Install repair sleeves
5. Install six-inch medium pressure bell joint muff
6. Installation of Main bypass
7. Assembly of cast-iron to steel dresser coupling
8. Installation of a six-inch posi-hold coupling
9. Installation of a six-inch plastic to cast-iron mechanical coupling
10. Install anode and test leads
11. Prime and wrap pipe
12. Perform measurement procedure for corrosion inspection at specified locations.

For each task (workstation), the instructor informed the employee of the nature of the work situation needed to accomplish the task. The employee would then gather all the material and tools needed to complete the task. The material and tools were laid out for the instructor to review prior to starting the task. If all was in order, the employee could continue with the workstation assignment. However, if any material or tools were missing the instructor would ask a key question that usually resulted with the employee identifying the missing tool or material. The employee would then start the procedure for his particular task with the instructor looking on from a distance. During this process, the instructor would ask critical questions to ascertain the knowledge of the employee. After the employee finishes his work at the station, the instructor reviewed the employee's completed task while the employee described how he completed his task step-by-step.

After the employee completes the task, the instructor evaluates the performance of the employee with a "pass or fail" and the employee rotates to the next workstation.

## **B. Quality Assurance and Quality Control Program**

### **1. Background and Objectives**

Quality Assurance (QA) is the set of planned and systematic actions necessary to provide appropriate confidence that a product or service will satisfy the requirements for quality. Quality Control (QC) is the set of observation techniques and activities used to fulfill requirements for quality.

People Gas' Gas Operations Division is responsible for the installation, operation, maintenance, repair, replacement, and retirement of all mains and service pipes up to the outlet of meters supplying individual customers within the City of Chicago. It is also responsible for all company activities performed on customer premises, annual and other scheduled outside leakage surveys, bridge and tunnel surveys, inspection and maintenance of distribution valves, and maintenance of the corrosion protection systems. To ensure that it performs these important activities in a safe, complete, and competent manner, Peoples Gas must have an effective QA/QC program.

Federal regulations 49CFR Part 192.605 (b) requires that Peoples Gas have procedures in its operating and maintenance plan to ensure safety during maintenance and operations of its facilities. More specifically, the regulations require Peoples Gas to review periodically the work performed by its employees and contractor personnel to determine the effectiveness and adequacy of the procedures used in normal operation and maintenance and to modify its procedures when it finds deficiencies.

The objectives for the review reported in this chapter were to determine whether Peoples Gas has an effective QA/QC program, and that the program includes appropriate elements such as inspections, field assessments, and audits.

### **2. Findings and Analysis**

#### **a. Written QA/QC program**

Peoples Gas has a document called the Quality Assurance and Quality Control Program.<sup>150</sup> This document states that the purpose of the QA/QC Program is “promote gas system and related employee safety through monitoring of field work activities covering the construction, installation, operation, and maintenance of gas facilities and the performance of customer requested work.” Its stated objectives are to (1) promote continuous improvement in all fieldwork activities that affect gas system safety, employee safety, and the quality of work performed, and (2) measure and assess compliance with procedures and applicable regulations.

The QA/QC Program focuses on gas system fieldwork and record keeping associated with that fieldwork. It does not cover other company activities like occupational safety and quality of

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<sup>150</sup> Response to Data Request #15.

received materials. The program is primarily a listing and description of audits. It defines three types of audits.

- Performance Audits – real-time observation of individuals performing work activities and tasks
- Field Verification Audits - evaluating recently completed work activities and tasks
- Records Audits - evaluations of completed records of work activities and tasks
- Operator Qualification oversight - to evaluate compliance with OQ rule requirements.

Engineers or supervisors within each of the three shops conduct the Performance Audits. The Compliance Monitoring Group performs the Field Verification Audits, performance audits, and Record Audits.

Peoples Gas' QA/QC Program does not identify who has responsibility for the program. It does not define any quality assurance organization. The document indicates that the "company's Internal Audit (IA) Department functions as overseer of the overall QA/QC program." It indicates that Internal Audit will perform a "limited number of field site audits each year using the same checklists used by the supervisors."

The program relies heavily on a QA/QC Database System to track audit records and make notifications of required audits. The program document does not specify who is responsible for maintaining this database.

#### **b. Performance Audits**

The heart of Peoples Gas' audit program is the Performance Audit function. Shop management personnel (e.g., supervisors, engineers) from each of the three shops conduct the Field Service and Distribution Department performance audits during regular supervisory visits to employee work sites in the field. In other words, there is no independence between the auditor and the audited activity or employee.

In defining the audit requirements for the Field Service and Distribution Department, Peoples Gas' program calls for the following:<sup>151</sup>

*Each performance audit will consist of one (1) per employee, per quarter. Each district shop must ensure that each activity is audited per quarter. This includes Field Service-related job activities performed by the Distribution Department (e.g., gas mechanics). In conducting a performance checklist audit, the auditor will observe and report on **only** [emphasis added] the checklist items performed during the time the auditor is with the crew or employee. By varying the time of day that audits are performed, it is **anticipated** [emphasis added] that all items for each checklist activity will be covered over time. In addition, audits should be performed on different employees/crews to ensure that all personnel are reviewed regularly.*

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<sup>151</sup> Responses to Data Requests #15 and #97.

Each activity checklist may have 10 to 48 activities. However, this procedure requires the auditor to look at only what the audited individual is doing at the time the auditor is on site, which may be a relatively short period. Thus, while a checklist may appear comprehensive, the auditor reports on only a few items and misses most of the work activities. Peoples Gas assumes that by varying the time of day supervisors perform audits, audits will cover all items for each checklist activity. Peoples' Gas does not track and compile the activities audited and thus does not know if in fact it covered all the work within each activity.

Peoples Gas identified the following activities performed by its Distribution Department:

- Leak Survey – Using Optical Methane Detector
- Leak Survey – Using Flame Ionization Detector
- Leak Survey – Business
- Leak Survey – Exposed Pipe
- Plastic Main Installation – Direct Burial
- Plastic Main Installation – Insertion
- Steel Main Installation
- Main Leak Repairs
- Locating of Gas Facilities
- Leak Recheck
- Anaerobic Sealant Repair
- LP/MP Conversion
- New Service Installation
- Service Renewal
- Main Retirement
- Service Pipe Retirement (2" & Smaller)
- Horizontal Directional Drilling
- Measurement Procedure for Corrosion Inspection (MPCI)
- Corrosion Control Activities Distribution (CCAD)
- Valve Inspection

Each activity has a specific activity checklist that covers normally performed distribution work activities. As an example, Appendix V-6, contained at the end of this section, provides the audit activity checklist for Item #5 above, Plastic Main Installation – Direct Burial.<sup>152</sup>

Peoples Gas' identified audit activities and audit checklists address topics and activities appropriate for an audit program.

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<sup>152</sup> Received during interview and follow-up to Data Request #49.

**c. Audits Performed**

Liberty requested reports for each shop that report the results of audit activity.<sup>153</sup> The reports were to include the number of Performance Audits performed by job code/activity, the number of deficiencies observed, a description of the deficiency, and corrective action taken for the period January 2004 thru September 2007.

The following table shows the number of audits conducted and the number of deficiencies recorded for 2006 and the first quarter of 2007.<sup>154</sup>

	<b>No. Audits Performed</b>	<b>No. Deficiencies Identified</b>
1 <sup>st</sup> Quarter 2007	654	33
4 <sup>th</sup> Quarter 2006	579	24
3 <sup>rd</sup> Quarter 2006	664	38
2 <sup>nd</sup> Quarter 2006	651	27
1 <sup>st</sup> Quarter 2006	316	9

The number of deficiencies was less than 5 percent of total number of audits.

Peoples Gas implemented a new QA/QC database on April 19, 2007. Liberty limited its detailed review to the data available from this new database covering the period from April through September 2007.

Peoples Gas conducted many Performance Audits during this period, but most of them concerned activities not relevant to Liberty’s investigation (*e.g.*, “collections”). Liberty counted 571 relevant audits for the period April 19, 2007, to September 30, 2007. The table below shows the number of audits and deficiencies identified for these audits.<sup>155</sup>

<b>Shop</b>	<b>No. of Audits Performed</b>	<b>No. of Deficiencies Identified</b>
North	181	6
Central	201	4
South	189	5
<b>Total</b>	<b>571</b>	<b>15</b>

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<sup>153</sup> Data Request #121.

<sup>154</sup> Response to Data Request #121.

<sup>155</sup> Response to Data Request #121.

The following table lists the specific issue or problem and the corrective action taken.

<b>Distribution Department Activity</b>	<b>Question</b>	<b>Response/Corrective Action</b>
6. Plastic Main Installation	Were all excess pieces of material removed from the job site?	Job not complete as of this date.
8. Main Leak Repairs	If required, are all excavations properly shored?	Job was on hold waiting for proper sheeting for the shoring of the excavation.
9. Locating of Gas Facilities	Were locates completed prior to the requested date?	Contractor not ready on specified date. Completed on due date, after A.M. hour.
	Were locates completed prior to the requested date?	Completed on due date, after A.M. hour.
11. Anaerobic Sealant Repair	Were the expiration dates on the Gaseal tubes checked prior to usage?	The tube did not have an expiration date...informed that the permabond mfg. was not complying with our codes and standards set for this product.
14. Service Renewal	Was the customer's house piping inspected and a meter registration test performed?	Customer left house before job was completed. Riser was left locked off.
	If work was scheduled with customer, was appointment kept by the Gas Company?	Customer was on vacation during the week I had a employee go there Thursday and Friday to no answer got home Saturday of Labor Day weekend did not do service until Wednesday after Labor Day.
	Were utilities located and marked before beginning excavations?	Contractor did not call DIGGER.
15. Main Retirement	Does the fire extinguisher have an inspection tag and are the inspections current?	Crew will switch out extinguishers with past due annual inspections.
16...Service Pipe Retirement (2" & smaller)	If access into the building can be obtained, is the service pipe disconnected from the building piping at the heel of the service and capped or sealed?	Heel of service is enclosed behind wall. Header openings plugged.
17...Horizontal Directional Drilling	Does the drill path have a minimum cover of 36" below grade?	30" of cover in some of the drill path.
18. Measurement Procedure for Corrosion Inspection (MPCI)	Were any issues indicated in notes?	Not necessary.
	Were any issues indicated in notes?	Not needed.
	Were any issues indicated in notes?	There were no issues. Good reads.
19. Corrosion Control Activities Distribution (CCAD)	Did the employee demonstrate mechanical competence?	Employee is a new GM, and did have trouble performing this task.

The 571 audits identified only 15 deficiencies. A result such as this would demonstrate a failure to perform meaningful audits for any utility. Given Liberty's limited observations of field activities at Peoples Gas, the identification of only 15 deficiencies in 571 audits is simply incredible. In addition, the recorded corrective actions for those deficiencies were inadequate. In



most cases, they merely identified a problem without providing any meaningful corrective action and resolution.

#### **d. Audited Activities of Contractors**

Peoples Gas' QA/QC Program requires auditing of contractors performing work for Peoples Gas. Audits are required for contractors who install mains and service pipes at a minimum frequency of one per calendar quarter per job type performed. Management personnel (*e.g.*, shop supervisor, engineer) perform contractor audits.<sup>156</sup>

Contractors perform the following activities auditable activities for Peoples Gas:

- Plastic Main Installation – Direct Burial
- Plastic Main Installation – Insertion
- Steel Main Installation
- LP/MP Conversion
- New Service Installation
- Horizontal Directional Drilling
- Corrosion Control Activities Distribution (CCAD).

Peoples Gas uses the same “Performance Audit” activity checklist for each activity performed by contractors as it uses for employees. Peoples Gas tracks contractor audits in the same QA/QC Database used for employee audits, and only provided results for the period April 19, 2007, through September 30, 2007. During that period, Peoples Gas conducted only four audits of contractors, all on the new service installation activity, and none had identified deficiencies. The query of the database reported, “There were no audits that resulted in Contractor Deficiencies from audits performed between 4/1/2007 and 9/30/2007 for any shop.”<sup>157</sup> Of the four audits, two were in the Central shop and two were in the South shop during May and June 2007. The period reported is one of the busiest times of the year for contractor activity.

#### **e. Audits by the Compliance Monitoring Group**

To help ensure that all levels of personnel within the Gas Operations Division consistently comply with code compliance regulations related to its business practices, in 2006 Peoples Gas established the Compliance Monitoring Group (CMG). The Compliance Monitoring Group audits a percentage of completed field activities and record updates. Its objective is “to mirror the audit protocol of the ICC Pipeline Safety Group, in identifying areas that could result in various observations and/or non-compliance violations of regulatory codes, including company procedures.”<sup>158</sup> The CMG’s audit scope includes code-compliance activities such as corrosion reads, inside safety inspections, valve inspections, leak survey, leak rechecks, and operator qualification oversight.

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<sup>156</sup> Responses to Data Requests #15 and #124.

<sup>157</sup> Response to Data Request #122.

<sup>158</sup> Responses to Data Requests #15 and #118.

CMG accomplishes this through its Field Verification Audits of recently completed work activities and tasks. CMG also conducts Records Audits, which are audits of field records of the district shop operations, the gas operations section, and the engineering department. The goal of the record audits is to verify the accuracy and completeness of the information supplied by field employees on various tickets, electronic formats and other record reporting devices.

CMG's record audit results that Liberty reviewed included topics such as:

- Valves installed by contractors
- Emergency valve inspections
- Corrosion control test station installation
- Corrosion inspector records
- As-built records
- Service pipe tickets
- Valve inspections
- Main maintenance
- Leak management.

CMG's field verification audits included corrosion control deficiencies and follow-up on shop deficiencies, mostly related to corrosion control. Documentation of CMG's audits included reports that described the audit, provided a summary of audit findings, gave CMG's recommendations, and listed deficiency details.<sup>159</sup>

### **3. Conclusions**

#### **1. Peoples Gas does not have an effective Quality Assurance program and practices.** (Recommendations V-8)

Peoples Gas has a QA/QC document that provides for audits of various activities. The activities and associated checklists cover the appropriate documents and could be helpful in meeting the objectives of promoting improvement in fieldwork safety and quality and assessing compliance with procedures and regulations.

It is unclear whether any individual is responsible for the QA program. The written document only mentions some oversight by Peoples Gas' internal audit department.

The heart of the program is a large number of Performance Audits. The auditor for these audits is someone from the same organization and shop that is performing the audited activity. Thus, these audits may accomplish no more than provide a supervisor with a minimum set of activities to observe that should be part of normal supervisory responsibilities. The auditor is only to report on items from the checklist that he or she actually observes. If the supervisor is on site for only a short period, he completes the audit paperwork without observation or monitoring of most of the work. Peoples Gas assumes that by varying the time of day that it performs audits, it will

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<sup>159</sup> Responses to Data Requests #118 and #119.

eventually cover all items for each checklist activity. However, Peoples Gas does not track and compile the work activities audited so does not know if in fact all work activities are covered.

Peoples Gas recorded the completion of a large number of Performance Audits. However, the number of deficiencies recorded from these many audits has been incredibly small. At any gas company, Liberty would expect to see good audits identify some deficiencies. At Peoples Gas, the total number of deficiencies is only a very small percentage of the number of audits performed. It serves little purpose to have recorded the completion of hundreds of audits and minimal deficiencies other than to give a false sense of success. Peoples Gas' recorded corrective actions are only statements of the deficiency.

Peoples Gas' audits of contractors are practically non-existent.

Peoples Gas' supervisors and engineers have the experience and skills to conduct meaningful audits. However, due to either insufficient time to perform all of their assigned duties or simply the culture at Peoples Gas that has not emphasized quality, they either do not perform the audits or do not perform them adequately.

## **2. The Compliance Monitoring Group (CMG) is making a positive contribution to quality assurance.**

The one bright spot in Peoples Gas' QA program is the work done by the CMG. It performs field verification and records audits. The CMG actually finds deficiencies, documents them, and makes corrective action recommendations. The CMG organization is somewhat independent of the organizations that it audits.

Peoples Gas formed the CMG in 2006. Its stated purpose is to "mirror" the audits performed by the ICC Staff. Much of the CMG's recent work relates to corrosion control, a topic of recent increased scrutiny by the ICC Staff. It appears that Peoples Gas' motivation for establishing the CMG was not because of a perception that QA needed to be stronger, but rather to minimize the deficiencies discovered by the ICC Staff.

## **4. Recommendations**

### **V-8 Improve the Quality Assurance / Quality Control (QA/QC) Program.**

While the new QA program is under development and implementation, Peoples Gas should make necessary improvements in the existing program. These include:

- Ensure that it audits all fieldwork activities, not just those taking place when the auditor happens to be on site
- Assign sufficient staff to conduct audits
- Track audit results and required corrective actions to completion
- Perform more independent audits using an expanded CMG or other personnel not from the shop performing the audited activity.

Peoples Gas should begin to make these changes immediately and report of progress to the ICC within six months of the date of this report.

**Appendix V-6 – Sample Audit Checklist**

**Quality Assurance/Quality Control Performance Audit  
Distribution Activity #5 - Plastic Main Installation - Direct Burial**

Audit Conducted By: \_\_\_\_\_  
Employee(s) Being Audited: \_\_\_\_\_  
Location: \_\_\_\_\_  
Date: \_\_\_\_\_

1. Is a valid permit for the work on the jobsite? Yes No N/A N/O
2. Are restrictions (lane closures, time restrictions, etc.), if any, on the permit being adhered to? Yes No N/A N/O
3. Does the jobsite adequately conform to the conditions of the "Work Area Protection and Traffic Control Guide"? Yes No N/A N/O
4. If applicable and when required, are all crewmembers wearing the proper personal protective equipment (helmet, safety vest, safety shoes, metatarsal foot guards, goggles, hearing protection, respiratory gear, etc.)? Yes No N/A N/O
5. Was a charged fire extinguisher present? Yes No N/A N/O
6. Does the fire extinguisher have an inspection tag and are the inspections current? Yes No N/A N/O
7. Is a "Distribution Department Procedure Manual" on the jobsite? Yes No N/A N/O
8. Were utilities located and marked before beginning excavations? Yes No N/A N/O
9. Are the procedures in the manual under Distribution General Order 6.000 "Excavation and Trenching Requirements" being adhered to? Yes No N/A N/O
10. If required, are all excavations properly shored? Yes No N/A N/O
11. Are openings properly backfilled in accordance with the procedures in the manual under Distribution General Order 7.009 "Procedure for Backfilling and Compacting Openings"? Yes No N/A N/O
12. Is adequate housekeeping being maintained on the jobsite throughout the day? Yes No N/A N/O
13. Are tools and equipment being adequately protected when not being used or when no Company personnel are in the immediate vicinity? Yes No N/A N/O

14. Was the job well planned such that all necessary equipment (tools, pipe, fittings, and material) are readily available? Yes No N/A N/O
15. Are "lockout / tagout" procedures being properly followed? Yes No N/A N/O
16. Is an installation drawing or sketch at the jobsite with the crew? Yes No N/A N/O
17. If a crew is working on tie-in or shutdown of a 12" or larger main, is a copy of the written shutdown/tie-in procedure on the jobsite? Yes No N/A N/O
18. Has the material delivered to the jobsite been inspected for damage? Yes No N/A N/O
19. Is the material being properly handled (are slings, padded skids, and rollers being used to handle material) to prevent damage? Yes No N/A N/O
20. Are only Company materials present/used? Yes No N/A N/O
21. Were all fused joints made per written procedures with the proper fusion tools? Yes No N/A N/O
22. Was fusion performed by a qualified personnel in accordance with Company procedures? Yes No N/A N/O
23. Does the "fusilier" have proper proof of qualification? Yes No N/A N/O
24. Is the pipe ditch being made according to Company's procedures? Yes No N/A N/O
25. Has plastic pipe been installed with clearance from sources of heat to prevent the heat source from elevating the temperature of the pipe to 100 F? Yes No N/A N/O
26. Is the pipe ditch free of rocks or abrasive material that may cause damage to pipe and coating? Yes No N/A N/O
27. If bottom of the ditch is not free of abrasive material, was a 3" bed of sand placed along the trench bottom to protect pipe? Yes No N/A N/O
28. Was pipe checked for gouges or damage prior to installation? Yes No N/A N/O
29. If pipe was damaged was the damaged part of the pipe cut out? Yes No N/A N/O
30. Was pipe installed with minimum of deflection and in a snake fashion? Yes No N/A N/O
31. If plastic pipe is installed with bends, is the radius of each bend greater than 20 times the pipe outside diameter? Yes No N/A N/O

32. If a main pipe is installed with mechanical fittings, is the plastic pipe connected to these fittings blocked and/or resting on undisturbed or well compacted soil to prevent shearing between the plastic and the mechanical fitting? Yes No N/A N/O
33. If the service is a direct burial plastic, was a tracer wire installed during the installation of the pipe? Yes No N/A N/O
34. Was a marking tape ("Caution Plastic Gas Pipe Buried Below") installed above the plastic? Yes No N/A N/O
35. If a branched main was installed, was the pipe placed on firm soil to prevent lateral or vertical movement? Yes No N/A N/O
36. Was the main installed with a minimum cover of 36" to grade? Yes No N/A N/O
37. If cover must be less than 24", was a casing or bridging for protection with Manager's approval? Yes No N/A N/O
38. Was the main installed with sufficient clearance when crossing other underground structures? Yes No N/A N/O
39. Was the main installed with sufficient clearance from other parallel utilities? Yes No N/A N/O
40. If valves are being installed, have they been checked prior to installation to ensure they are working properly? Yes No N/A N/O
41. Have the number of turns required to open or close the valve been verified and noted on valve installation form? Yes No N/A N/O
42. Are valve basins or boxes at readily accessible locations away from heavy traffic, parking lanes and course of surface water? Yes No N/A N/O
43. Are valve basins or boxes properly constructed and independently supported from the main? Yes No N/A N/O
44. Was pipe properly backfilled to provide firm support under the pipe and prevent damage to pipe? Yes No N/A N/O
45. Upon completion of the job was jobsite left in acceptable condition? Yes No N/A N/O
46. Were all excess pieces of material removed from the jobsite? Yes No N/A N/O
47. Was the pressure gauge/pressure recorder being used have a calibration tag and was it calibrated within the past twelve months? Yes No N/A N/O

48. Was the main pressure tested in accordance with General Order 3.000? Yes No N/A N/O

Notes: \_\_\_\_\_  
\_\_\_\_\_



## **C. Programs, Maps, and Records**

### **1. Background and Objectives**

Accurate maps are necessary to locate pipeline facilities; accurate records are required to administer safety program requirements. Records include the data necessary to evaluate system components, to support compliance with code requirements, and to assist in tracking and scheduling of required inspections. Various processes and programs support the safe construction, operations, and maintenance functions of a gas pipeline system. These include work order and inspection planning, materials management, long range planning, and maintenance of procedures and information databases.

The Code of Federal Regulations 49CFR192 contains safety requirements for distribution pipeline facilities. Maps and records requirements are in several code sections including §192.13, §192.53, §192.63, §192.225, §192.285, 192.491, §192.517, §192.605, §192.613, and §192.807.

The objectives of Liberty's investigation reported in this section were to evaluate Peoples Gas':

- On-site supervision
- Data and information management
- Mapping and record maintenance functions
- Planning processes
- Participation in industry committees.

### **2. Findings and Analysis**

#### **a. On-Site Supervision**

Liberty conducted a series of field inspections of district operations, meetings with managers and General Supervisors, and observations of crews performing various code-mandated activities such as planning routine code-mandated inspections.<sup>160</sup> Liberty's observations of crews in the field at work locations generally found that General Supervisors were not at the job site. Liberty often observed General Supervisors accomplishing paperwork in the district office or performing planning functions at their desks. It is good practice to have General Supervisors on site with their crews providing supervision and direction of the crews' activities.

Peoples Gas needs to find ways to get its General Supervisors into the field. The Operations Field Support Group assists in workload planning, evaluates work force needs, and develops routes for work activities. This group may be able to relieve General Supervisors of some paperwork and planning responsibilities. In addition, Peoples Gas may need to retain more General Supervisors to bring about greater field supervision.

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<sup>160</sup> Inspections and observations made June 5-7, 2007, July 17-19, 2007, August 13-16, 2007, September 17-20, 2007, November 14-15, 2007, April 30, 2008, and May 1, 2008.

## **b. Data and Information Management**

Peoples Gas maintains several “legacy” computer programs and databases in which it stores information about system components. It uses the information in those databases to evaluate system components, to maintain and repair the gas distribution system, to schedule code-mandated inspections, and to make system management decisions.

The following is a brief listing and description of the primary computer systems and databases at Peoples Gas.<sup>161</sup>

- Navigate produces monthly reports and updates based on job activities, issued, completed, and pending. Distribution Operations uses it to develop the regulatory compliance workload.
- GMOS, the Gas-Main-On-Line System, is the primary database for Peoples Gas’ system. GMOS contains segment histories of approximately 80,000 segments on the distribution system. Dynamic segmentation identifies a different main segment whenever the following segment factors change: diameter, material, pressure, the “in” street, and year installed. There are associated segment inspection requirements such as corrosion control requirements. GMOS provides output data and information for the main ranking index (MRI).
- GVAL provides valve information for GMOS segment data.
- GCOR provides corrosion information associated with GMOS segments.
- DMIS (distribution management information system) provides service information.
- GMAI provides maintenance activities that provide information for the MRI (main ranking index) evaluations.
- CFirst is the Company’s customer information system.
- Stoner is a gas-pressure modeling tool used to calculate pressures on a distribution system. Information from GIS information is manually entered into the Stoner model.
- GIS is Peoples’ geographic information system. GIS provides information to the Navigate system where system data may be viewed by field crews and used in work activities and applications.

Liberty understands that Peoples Gas is in the process of developing a new Work Order Management System (WAMS), an integrated computer system.<sup>162</sup> WAMS is a \$22 million system that will be able to, among other functions, issue electronic work tickets, and time tickets. Peoples Gas expects the system to be complete in March 2009. It will convert and migrate Peoples Gas’ existing multiple legacy computer systems and formats containing information of system assets and workload planning. The project includes hardware, software, training, and change management functions. Peoples Gas expects WAMS to replace the legacy systems, including GMOS, GVAL, GCOR, DMIS, and GMAI.

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<sup>161</sup> Interview with Engineering Distribution Design May 15, 2008, June 6, 2007, September 19, 2007, and Response to Data Request #239

<sup>162</sup> Response to Data Request #248

The integrated system approach is necessary and appropriate. The existing systems are cumbersome to access and use. Peoples Gas needs to replace these legacy systems, convert its data, and implement a new modern system that allows it to evaluate its system components and streamline its scheduling of inspections and manage its work.

**c. Maintaining Maps and Related Records<sup>163</sup>**

Peoples Gas receives information concerning work performed on its mains and services from its field crews. Field crews complete main and service work orders, and the crews and engineering technicians (on contractor jobs) prepare as-built sketches, which they submit to the engineering GIS section. The engineering section updates its GIS maps and GMOS data within 14 days. Liberty observed that there is no backlog, and that Peoples Gas completes this work routinely within 7 days of receipt from the field forces.

Engineering's Centralized Planning Group (CPG) processes service line work by entering service line data into the distribution management information system (DMIS) system within one week of completed field installation work. CPG also updates Peoples Gas' mains information system (GMAI) with main maintenance work data and information.

Liberty found this to be excellent performance for an operator updating maps and records and providing readily accessible data for meaningful and timely integration, evaluation, and analysis.

**d. Planning**

The Engineering Distribution Design Group performs the functions of reviewing system assets, determining future system needs, determining what system design parameters it needs to achieve in terms of system load, system pressures, and design-day requirements, and developing a delivery system capable of providing those supply needs for the future. Those system plans involve an assessment of the materials and components that Peoples Gas will need to replace and a framework for doing so. The framework includes guidelines for identifying current replacements, integrating those efforts with third-party construction projects, and meeting short- and long-term goals.

*1. Long Term Planning*

Peoples Gas' informal long-term planning process identified the following long-term goals:<sup>164</sup>

- Remove all cast iron and wrought iron from the distribution system by the year 2050.
- Extend and loop the 150-psig interstation system to enhance system reliability.
- Replace as much of the low-pressure distribution system as practical through low-pressure to medium-pressure conversions, retiring low-pressure regulator vaults, replacing vulnerable segments, and identifying higher cost-benefit opportunities.
- Extend the medium-pressure feeder supply network for adequate for supply pressure and emergency shutdowns of segments on the system.

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<sup>163</sup> Responses to Data Requests #233, #234, and #235, and Interview with Distribution Design May 15, 2008.

<sup>164</sup> Interview with Engineering Distribution Design May 15, 2008, and September 19, 2007.

Peoples Gas applies to this process spatial analysis, which is a general geographic identification of areas of its system installed with similar factors (*e.g.*, age, materials, and leak rates).

Peoples Gas' long-term planning efforts lack structure. It does not involve a systematic, comprehensive, and documented process describing the issues evaluated and the process' findings, conclusions, and recommendations.

## 2. *Short to Medium Term Planning*

Peoples Gas identified shorter (two- to five-year) term goals, including:<sup>165</sup>

- Approach the City of Chicago, *i.e.*, Water, Sewer, Highways, Street Lighting, and other utilities via the Office of Underground Utility Coordination, to coordinate projects the City or other utility operators are planning to reduce paving restoration impacts.
- Approach the City utility agencies to identify facilities more prone to failure and coordinate replacement projects.

## 3. *Prioritization of System Improvements*<sup>166</sup>

On a continuing basis, Peoples Gas prioritizes main replacements in the following order:

1. Respond to any abnormal operating conditions (*e.g.*, high consequence leaks, water in the low-pressure system, ICC requests) and code changes requiring immediate action.
2. Replace within 12 months any segments with Main Replacement Index (MRI) ranking of 6.0 or greater. MRI is a software tool that identifies the safety vulnerability of segments based on leak and maintenance history.
3. Perform public improvement projects, subject to potential conflicts and project timing. Peoples Gas considers any segment with an MRI greater than 3.0 for replacement when near a City of Chicago or other outside agency public improvement project. It makes an effort to leverage synergies between the cast and ductile iron replacement program and low- to medium-pressure conversion projects with public improvement projects.
4. Perform other system improvement projects. Prioritization for the remaining work continues with a more holistic approach designed to maximize system synergies. Categories of these system-improvement projects include:
  - Cast and ductile iron main replacement
  - Low- to medium-pressure conversion program areas
  - Building infrastructure to accommodate major changes in loads in a specific geographic region
  - Long-term planning to strengthen or improve the system, including interstation main looping and new medium-pressure vaults.

Factors that go into the prioritization include:

- System reliability (system networking, adequate pressure, supply, valve spacing, etc.)

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<sup>165</sup> Interview with Engineering Distribution Design May 15, 2008,

<sup>166</sup> Responses to Data Requests #145, #154, #155, and #156.

- District input (geographic knowledge of the area, field knowledge of system, current field conditions)
- Other synergies (including, relocating inside meters to the exterior, inside safety inspection reductions, number of CAB/Bare Steel services in the area and ERT replacements)
- Establishing priorities for system replacement projects, including applying “Bang-for-the-Buck,” a software application that helps determine the value and scope of a proposed project versus another project by comparing future operating and maintenance savings and assigning a cost/value ratio.

#### 4. *Up-rating Pressures of Existing Mains*<sup>167</sup>

Peoples Gas rarely upgrades high-pressure lines to a new and higher operating pressure. In addition, Peoples Gas does not upgrade medium-pressure to high-pressure.

To upgrade its low-pressure system, Peoples Gas inserts or replaces low-pressure mains based on:

- Proximity of services to one another
- Related customer inconvenience of being out of service during the process
- Peoples Gas’ desire to minimize long services crossing the street. It prefers to install smaller diameter lines, one on each side of the street.

Peoples Gas does not consider up-rating existing low-pressure mains. However, if Peoples Gas does up-rate pressure in segments of its system, its process must meet the requirements of 49CFR192 subpart K. This subpart requires that Peoples Gas’ up-rating process include the evaluation of data on affected system components and their capability of withstanding new and higher pressures, as well as detailed procedures to increase safely operating pressures.

#### e. **Participation in Industry Committees**

Peoples Gas employees participate in a number of industry committees. As a general practice, it is appropriate for Peoples Gas to effectively participate in industry work methods and practices groups, provide leadership roles in standards development committees, and participate in research and development forums to ensure its designs and procedures keep abreast with the best approaches to operating gas systems.

However, the current assignments of personnel on industry committees have resulted in too many committees assigned to the same individual.<sup>168</sup> The effectiveness of such assignments is questionable. Peoples Gas should periodically review committee assignments to ensure they meet company goals and objectives for its participation.

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<sup>167</sup> Interview with Engineering Distribution Design May 15, 2008,

<sup>168</sup> Response to Data Request #246

Following the acquisition of North Shore Gas, Peoples established a Materials Standards Committee (MSC) under ICC Peoples Gas Light and Coke Company Order #11. Order #11 established MSC responsibilities that included evaluation of new and existing materials, tools, and equipment, assuring proper disposition of inactive and obsolete materials, evaluating revised material procurement and delivery system, and making recommendations for improvement. Because of the merger with Integrys, the MSC has been disbanded, to be replaced by a committee as part of the Integrys Energy Group with a similar mission. In its comments on the draft of this report, Peoples Gas said that the new committee was chartered in November 2007 and met in December 2007. Peoples Gas should ensure that the lack of continuity of this committee during the transition period does not compromise safety policies.

### **3. Conclusions**

#### **1. General Supervisors do not spend sufficient time on job sites with their crews. (Recommendation V-9)**

General supervisors should spend the majority of their time on site with field crews. However, they have a variety of office duties that keep them otherwise occupied. During Liberty's observations, they were usually not at the job site. Many of the office duties are routine planning activities that the Field Support Planning group could perform. The solution may also require hiring more General Supervisors.

#### **2. Legacy Computer Systems are cumbersome to access and use. (Recommendation V-10)**

Peoples Gas operates and maintains several legacy computer programs and databases in which it stores information about its system components. The systems are cumbersome to access and use to evaluate data from which Peoples Gas makes system management and work management decisions. Peoples Gas needs to replace these legacy systems, convert its data, and implement a new modern system that allows it to evaluate its system components and streamline its scheduling of inspections and manage its work.

#### **3. Peoples Gas' processes of updating its GIS mapping systems, databases, and records with information received from its field forces is effective and timely with essentially no backlog.**

Peoples Gas routinely updates its main and service records databases within 7 days after receipt of field records, well within the 14 days allowed by its procedures. Liberty finds this to be excellent performance.

#### **4. Peoples Gas develops its long-term plans for the distribution system informally. (Recommendation V-11)**

Peoples Gas' long-term plans, which call for replacement of cast and ductile iron, extending and looping the interstation system, migration from low to medium pressure, and extending the medium pressure feeder system, are developed informally. The plans are not the result of a formal, structured process, resulting in a lack of specificity of action plans. The plans could be

improved by greater specificity including developing and updating more specific long-term objectives, intermediate goals, and recommendations.

**5. Peoples Gas does not have a procedure for up-rating low-pressure mains as required by code.** (Recommendation V-12)

Peoples Gas does not have a written procedure for the up-rating process (converting low-pressure mains to a higher operating pressure). The process should ensure that the design and capability of system components are within the limits of the pressure up-rating. This is a code-mandated requirement and warrants a formal procedure.

**6. Peoples Gas' memberships on industry committees may not be effective.** (Recommendation V-13)

Peoples Gas' employees are members of various industry committees, which helps the company understand and develop industry best practices. However, the company has not reviewed its participation to limit the number of committees assigned to any one individual. Multiple memberships may overwhelm certain individuals and result in ineffective participation, negating the company's goals of its membership.

**7. Peoples Gas disbanded the ICC-ordered Materials Standards Committee.** (Recommendation V-14)

Following the acquisition of North Shore Gas, Peoples established a Materials Standards Committee (MSC) that formally evaluated suggested changes in its procedures and materials procurement processes. This Committee has been disbanded to be replaced by a committee with a similar mission as part of the Integrys Energy Group. In its comments on the draft of this report, Peoples Gas said that the new committee was chartered in November 2007 and met in December 2007.

## **4. Recommendations**

**V-9 Provide the means for, and require that, General Supervisors spend more time in the field on job sites with their crews.**

Peoples Gas should identify means of increasing the effectiveness of their General Supervisors, eliminating tasks that keep them away for their primary activities, and increasing their on-site supervision of crews. Peoples Gas' Operations Field Support should continue to develop its planning applications function to perform routine planning for code compliance activities to relieve General Supervisors from performing tasks and activities in the office. In addition, Peoples Gas may need to hire more General Supervisors.

Peoples Gas should develop a written plan for meeting this recommendation within three months of the date of this report. The plan should include schedules and specific goals for General Supervisor on-site time.

#### **V-10 Upgrade the legacy computer systems as planned.**

Peoples Gas operates and maintains a number of “legacy” computer programs and databases in which it stores information about its system components. The systems are cumbersome to access and use to evaluate data from which Peoples Gas makes system management decisions. Peoples Gas should replace these legacy systems, convert its data and implement a new modern system that allows it to evaluate its system components and streamline its scheduling of inspections and manage its work.

Peoples Gas plans to complete this change by March 2009. It should report on any delays or revised schedules for implementation as they occur.

#### **V-11 Develop a structured process for long term planning.**

Peoples Gas should develop its long-term plans for the distribution system in a more formal, structured process. This includes having plans with greater specificity, and developing and updating long-term objectives, intermediate goals, and recommendations.

Peoples Gas should begin to develop this process within three months of the date of this report, and complete its implementation within one year of the date of this report.

#### **V-12 Develop and implement a procedure for up-rating low-pressure mains.**

Peoples Gas’ up-rating process (*i.e.*, converting low-pressure mains to a new and higher operating pressure) needs to be more formal and include ensuring that system components are within the limits of the pressure up-rating and are designed for and capable of withstanding the new higher operating pressure.

Peoples Gas should implement the new procedure within six months of the date of this report.

#### **V-13 Review industry committee participation.**

Peoples Gas should review the industry committees in which it participates to ensure that it assigns the appropriate people, and that it does not assign individuals to too many committees, resulting in ineffective participation and negating the company’s goals of its participation.

Peoples Gas should complete this review within six months of the date of this report and make any appropriate changes within one year of the date of this report.

#### **V-14 Establish the combined Integrys successor to the Peoples Materials Standards Committee (MSC).**

An ICC Order required the MSC to fill an identified need. Peoples Gas dissolved the MSC in anticipation of a joint Integrys committee. In its comments on the draft of this report, Peoples Gas said that the new committee was chartered in November 2007 and met in December 2007.



## **VI. Performance**

### **A. Performance Measures**

#### **1. Background and Objectives**

Effective organizations measure progress towards achieving objectives and targets. Organizations can use performance measures (or performance indicators) to monitor the achievement of corporate and operational objectives and to assess the performance of day-to-day activities. Management can use performance measures to hold parts of the organization accountable and to show quantitatively whether a group or the company is living up to commitments. Companies can also use performance measures to identify opportunities for improvement through comparison both within the company over time or between different units or organizations. Benchmarking aims to share understanding of how organizations perform, identify which processes explain differences in performance, and where and how improvements can be made. Companies can use performance measures in this process to identify good performance and problem areas, and to measure the effect of action.

Gas system operators like Peoples Gas have special reasons to evaluate their systems and their performance because of the potential for serious incidents. They need to know the nature of incidents in the industry, and the causes of leaks and failures on their systems. These evaluations are important to making sound decisions for gas system improvements. Performance measures can help operators in these evaluations to gauge consistently the effectiveness of policies, programs, and improvement activities. Operators can use performance measures in program evaluation tracking, such as percentage of notifications not responded to in a timely manner, one-call notification center errors, damage by cause and responsible party, failure to mark accurately, excavation practices not sufficient, pipelines marked accurately and damage occurred, and inaccurate pipeline location in marking of underground facilities. Peoples Gas should use performance measures as tools to help judge how well it operates its gas system and how well it serves customers. To address adequately safety performance, Peoples Gas should identify key safety performance measures, set acceptable levels of performance, and hold all managers accountable for meeting those targets.

#### **2. Findings and Analysis**

In response to a request for a list and explanation of all operational performance measures that it tracks and uses, Peoples Gas provided a list of 12 reports.<sup>169</sup> The table that follows lists these reports and provides Peoples Gas' stated use of the report.

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<sup>169</sup> Response to Data Request #138.

<b>Report</b>	<b>Frequency</b>	<b>Use</b>
Pending Leaks	weekly	All pending underground leaks by shop
Leaks Cleared since last report	weekly	All underground leaks with clear code by shop
Old Pending Leaks	weekly	All the pending underground class 1, pending class 2 – over 270 days, and pending class 3 – over 365 days
Material Defects, Construction and or Corrosion Causes	weekly	All underground leaks repaired that were identified to be material defect, construction or corrosion caused
Leaks Entered in System Since last report	weekly	Track new underground leaks entered in the system
Repaired Leaks that have not been Cleared	weekly	Underground leaks that have a repair information in the system but no clear codes have been entered
Leaks with an Overdue Recheck	weekly	Pending overdue underground leaks
Status of Leak Indication	weekly	Count of pending, cleared and received leaks
Inspection Counts	Anytime, self-generated	Underground leak recheck counts by shop, employee, completed or pending for a specific issue date or competed date
Inspection Detail Report	Anytime, self-generated	What underground leak rechecks needs to be completed, or what recheck needs to be assigned, or completed rechecks
Overdue Completed Inspection Report	Anytime, self-generated	All underground leak recheck inspection that went overdue
Leak Order Tracking	Anytime, self-generated	Count of all inside leak emergencies by emergency condition code, time received and minutes before employee arrived at scene

The responses to several data requests on this subject contained a limited response and Peoples Gas stated that it had not identified any additional performance measures that it should track.<sup>170</sup> During the course of the investigation, Liberty identified other information and data that Peoples Gas or groups within the company tracks. Liberty found that most departments use various forms of measurement to report on meeting goals or performance. It was clear, however, that Peoples Gas does not have a complete and consistent performance measure system and the many indicators are both informal and not shared outside of individual groups.

Peoples Gas’ Field Operations tracks several important operating parameters.<sup>171</sup> It tracks these metrics by district and for the company as a whole. These parameters include:

<sup>170</sup> Responses to Data Requests #25, #138, #139, #142, #143, and #154.

<sup>171</sup> Response to Data Request #252.

- Valve inspections completed per month
- Percentage of mandated valve inspections completed
- Number of mandated valves needing additional work
- Number and percentage of same day mark outs performed
- Number and percentage of mark outs performed within time frame
- Number of regulator vault inspections
- Number of regulators retired or replaced per year
- Number of MLD inspections issued, completed, pending and over due
- Number of damages to the gas system by self and outside parties
- Number of old leaks and check dates.

Peoples Gas tracks corrosion control inspections and corrective actions using a report called “Weekly Corrosion Job Rate Report.”<sup>172</sup> It organized the report by shop (district). The report tracks overdue inspections, overdue corrective actions (CA), and actions pending for up to 180 days into the future. The report is computer-generated for the Corrosion Engineer every week; district management and the vice president of operations receive a copy.

Peoples Gas tracks and reports on the several leak management measures listed in the table above. Peoples Gas also tracks other information with respect to leaks, including the time to respond to a leak (which is required by the ICC), and cost items associated with repairing leaks, but apparently does not consider those as performance metrics.

Liberty found no indication that Peoples Gas tracks progress or compares progress on replacing older mains and services that the industry knows are problematic. Liberty found no indication that Peoples Gas’ management identified and systematically tracked key performance measures or identified targets for acceptable levels of performance for key indicators. Management did not ensure that supervisors responsible for the activities behind key performance indicators had systematically received reports on key performance indicators or received direction on the importance of meeting target performance levels. Liberty found no evidence that Peoples Gas does any comparative analysis using common measures and publicly available industry information. There are many additional performance measures that Peoples Gas could find useful. Examples are:

- Time to raise deficient readings on mandated programs to acceptable
- Time to respond and correct various types of leaks
- Number of customers affected by non-routine gas supply issues
- Number and severity of audit findings
- Number of customer complaints related to operational issues
- Number of regulatory violations
- Number of incidents and customers affected by gas emergencies or other non-routine operations

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<sup>172</sup> Response to Data Request #25.

- Average time a customer is out of service.

### **3. Conclusions**

#### **1. Peoples Gas does not have an acceptable performance measures program.**

(Recommendation VI-1)

Peoples Gas' performance measures lack completeness and formality. Various routine reports do not clearly show performance, trends, and goals. Many performance measurements are informal and not shared across the company. Peoples Gas does not effectively use benchmarking. Peoples Gas' definition and use of performance metrics characterize what Liberty might have expected of a gas operator 30 or more years ago. Many companies today have complete arrays of metrics that present, in easy to understand and graphical formats, performance at varying levels of detail that management at various levels can effectively use to hold people accountable, discern areas that need improvement, understand performance trends, and make adjustments in operations.

Peoples Gas' computer systems inhibit an effective performance measures program. Peoples Gas uses a mainframe computer with a more modern interface (Navigate) for the mobile communications. Updates and synchronization between the systems are problematic. Report generation is not user-friendly.

### **4. Recommendations**

#### **VI-1 Implement a modern and effective performance measures program.**

Peoples Gas should significantly improve the completeness, presentation, and dissemination of performance reports. Peoples Gas should retain expert assistance in the development of the program. Peoples Gas should replace the obsolete systems that inhibit a useful performance measures system.

Within six months of the date of this report, Peoples Gas should have a documented plan for improving its performance measures program. At minimum, this plan should provide a complete definition of performance metrics, a schedule for their implementation, and the commissioning of a computer-system study.

## **B. Comparative Analysis**

### **1. Background and Objectives**

Evaluations of the hazards, including studies of gas distribution-system incident data by AGA and PHMSA's Office of Pipeline Safety, determined that the dominant cause of "serious incidents" is outside-force damage. Serious incidents are those involving fatalities and injuries requiring hospitalization, and property damage exceeding \$50,000. Outside-force damage includes excavation damage, subsidence, and weather-related earth movement. Other significant causes involve corrosion and material failure, operator error, and damage to outside meter and regulator sets. For this reason, it is important for gas system operators to evaluate continually

their systems, the nature of incidents in the industry, and the causes of leaks and failures on their systems. These evaluations are important to making sound decisions for gas system improvements. Indeed, rather than waiting for serious incidents involving gas fires or explosions to occur to guide its decisions, operators should implement preventive and mitigation measures that address precursors to incidents. Moreover, they should identify performance measures that will help gauge the effectiveness of policies, programs, and improvement activities.

An AGA study in 2004 concluded that, although excavation damage was the most significant contributor to distribution incidents, only 43 percent of operators used extra preventive and mitigation measures to address this threat. This compared to 58 percent that applied effective preventive measures for the threat of corrosion on bare steel and 50 percent for measures to reduce the risks of outside-force, weather-related incidents on cast iron pipe.

Considering Peoples Gas' size and location, it should not just be an operator that meets the minimum requirements of a federal safety code developed to ensure the safety of an average gas system operating in the United States. The system Peoples Gas operates is not an average system. It is unique in terms of materials, age, and the complexity of the environment in which it operates. Peoples Gas' approach to asset management and performance evaluation should be at the highest practical level.

This section of the report compares Peoples Gas with a peer group of utilities for the years 2004, 2005, and 2006 using the following parameters:

- Main leaks other than caused by excavation damage
- Main leaks caused by excavation damage
- Service line leaks other than caused by excavation damage
- Service line leaks caused by excavation damage
- Leak backlog
- Lost and unaccounted for gas.

## **2. Findings and Analysis**

### **a. Data and Peer Group**

The U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Office of Pipeline Safety collects annual information and statistics from natural gas distribution companies. Over 1,400 companies file data that describe the make-up, materials, and performance of their distribution systems. Liberty used data for the years 2004-2006 to compare Peoples Gas with other companies.

To determine a peer group with which to compare Peoples Gas, Liberty used calendar year data for the year 2005 to identify utilities in a northern, urban environment that met the following criteria:

- Miles of main:  $\geq 3,000$  and  $\leq 10,000$
- Number of services:  $\geq 250,000$  and  $\leq 700,000$
- Mains installed before 1970:  $\geq 25\%$  and  $\leq 80\%$

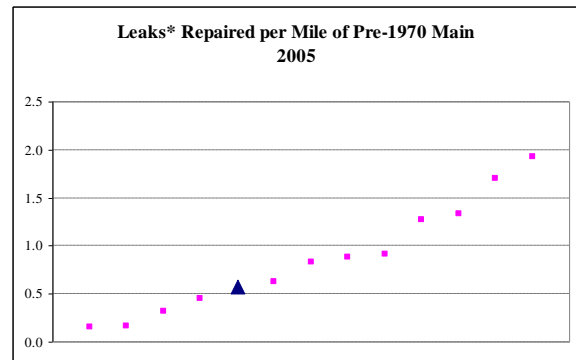
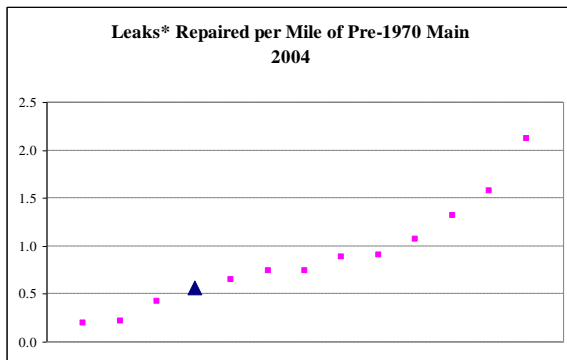
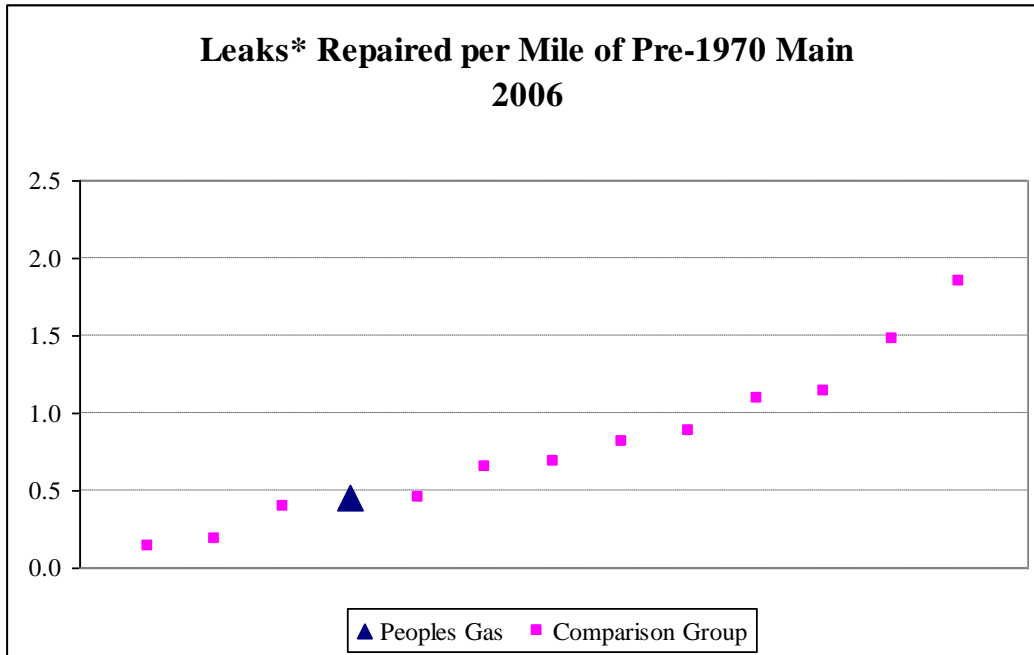
- Cast iron mains:  $\geq 5\%$

The table below shows the peer group Liberty developed and the data relevant to the criteria used:

<b>Company</b>	<b>Miles of Main</b>	<b>% Pre-1970 Mains</b>	<b>% Cast Iron Mains</b>	<b>No. of Services</b>
Baltimore Gas & Electric	6,586	45.3	21.0	505,792
Con Edison – NYC	4,247	65.7	33.1	378,693
Keyspan Boston	6,373	69.4	36.4	480,050
Keyspan NYC	4,034	66.2	44.3	558,289
Keyspan Long Island	7,370	63.8	5.4	495,550
Laclede St. Louis	8,201	50.1	10.8	601,153
NFG Buffalo	9,519	47.9	5.0	449,740
National Grid	8,351	50.0	9.2	516,594
PECO	6,542	41.8	12.9	402,132
Peoples Gas Light & Coke	4,012	52.1	42.3	505,018
Philadelphia Gas Works	3,016	78.5	54.5	457,913
Cincinnati Gas & Electric	5,284	36.4	11.1	392,922
UGI	4,919	40.8	8.8	314,433

**b. Main Leaks Other Than Those Caused by Excavation Damage**

This metric indicates the likelihood of leakage of an operator’s leak-prone mains. Leak-prone mains are those installed before 1970, as federal codes required post-1970 mains to have cathodic protection and therefore should not experience leakage problems to the same degree. Plastic mains, which came into widespread use during 1970-1980, also should not experience non-excavation leaks. The following charts compare Peoples Gas to the peer group in terms of leak repairs per mile of pre-1970 mains, other than those caused by excavation damage, for the years 2004, 2005, 2006.

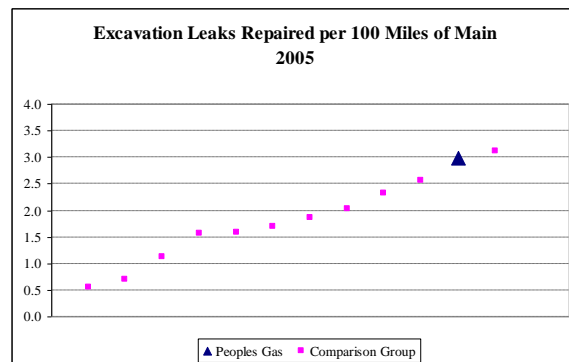
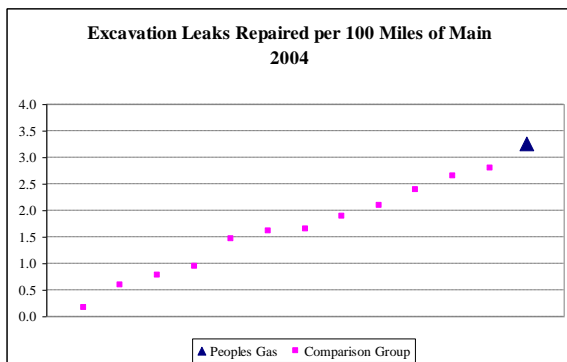
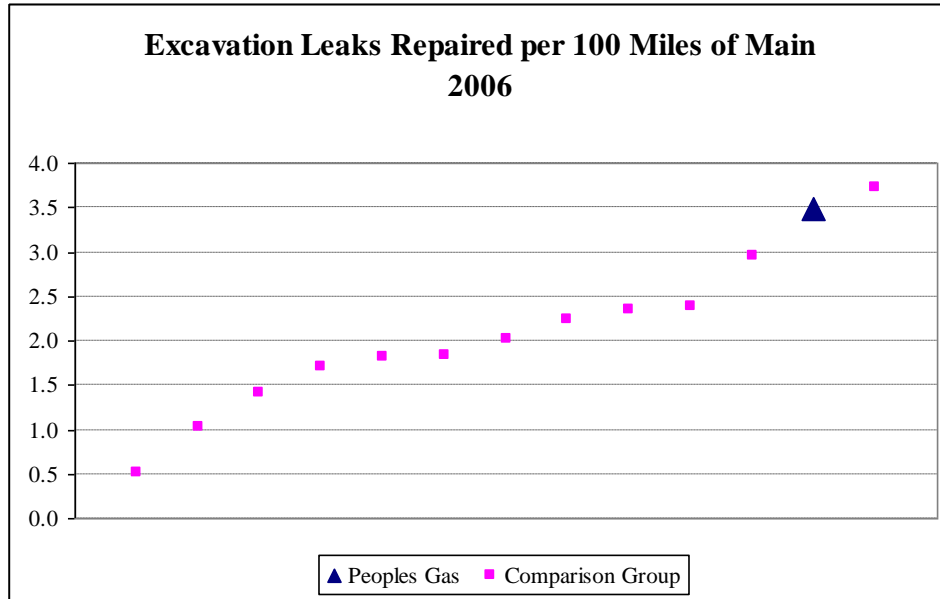


\* All leaks other than those caused by excavation

Peoples Gas’ main leak repair rate is below average. This metric may indicate a system less prone to leakage, unless Peoples Gas is not repairing as many leaks as other operators per mile of main. Peoples Gas may reduce its leak rate by simply not repairing leaks and carrying a large backlog of leaks to be repaired. From these charts alone, it is unclear what the effect of reducing the leak backlog will have on this metric. Hence, this result must be reviewed in conjunction with the charts comparing leak backlog to the percent of total leaks repaired.

**c. Main Leaks Caused by Excavation Damage**

The charts below show the relative performance of Peoples Gas' excavation damage-prevention efforts in terms of leaks repaired per 100 miles of main.

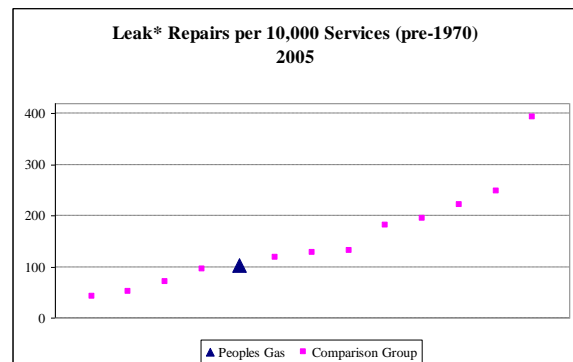
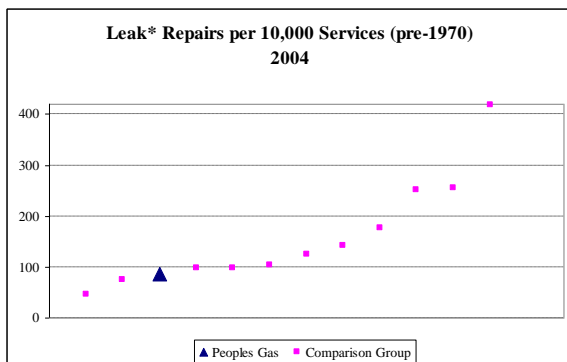
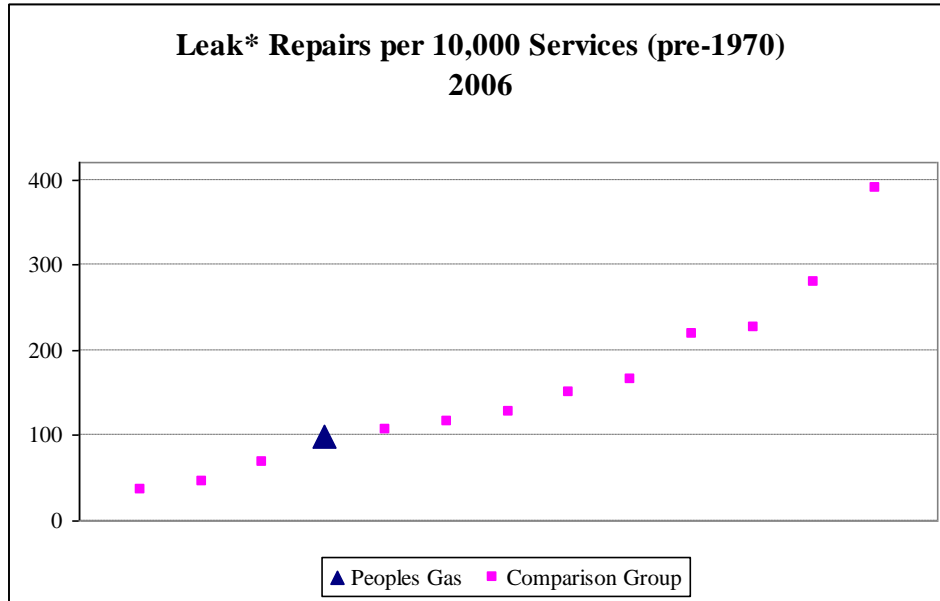


Peoples Gas' excavation-damage-prevention performance ranks poorly relative to the peer group. Its damage rate to mains resulting from excavation is in the highest risk sector of its peer companies, an indication of poor damage prevention performance.



**d. Services Leaks Other Than Caused by Excavation Damage**

The charts below show the number of services leaks from all causes except excavation repaired per 10,000 services installed prior to 1970.

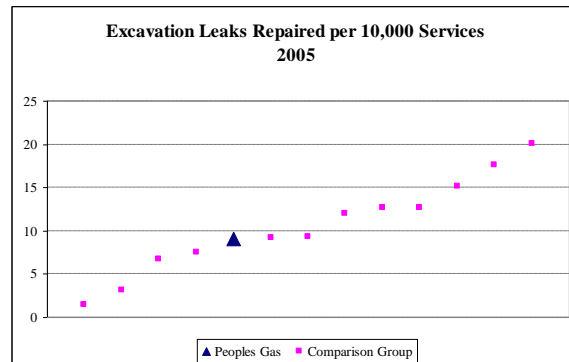
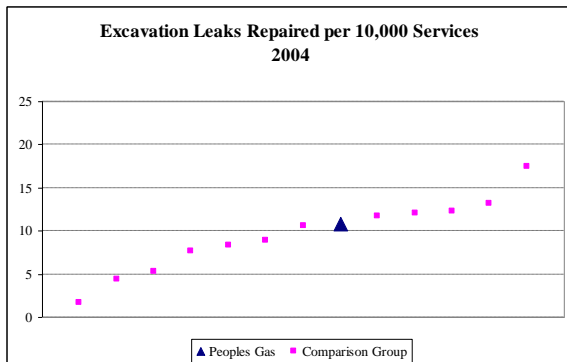
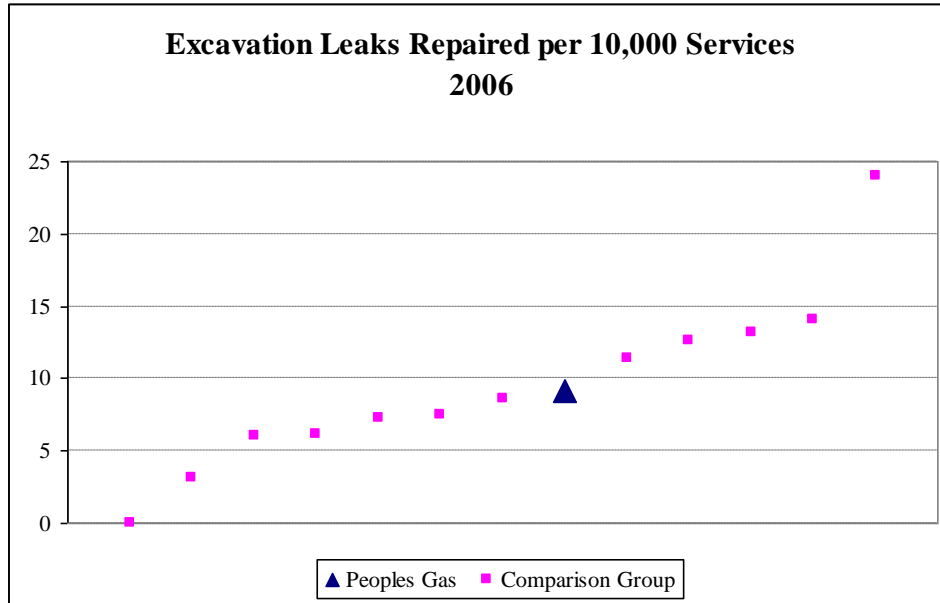


**\* All leaks other than those caused by excavation**

These charts appear to place Peoples Gas in a favorable performance risk sector. The lower rate of leaks experienced implies better material performance than the peer group. However, Peoples Gas may artificially depress this number by not repairing service line leaks in a timely fashion. Therefore, this metric also needs to be reviewed in the context of the leak repair backlog.

**e. Services Leaks Caused by Excavation Damage**

The charts below show the relative performance of Peoples Gas’ excavation damage-prevention efforts in terms of leaks repaired per 10,000 services.

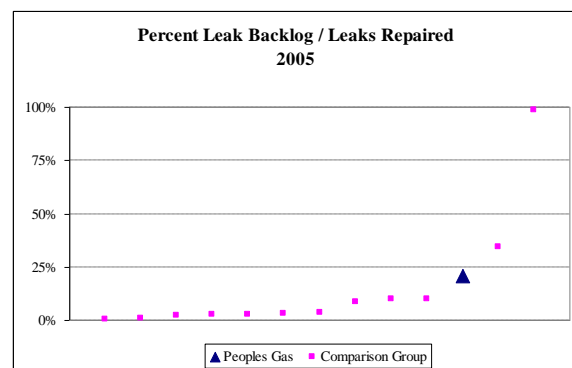
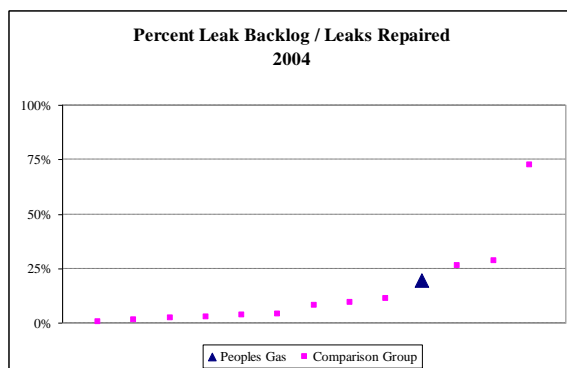
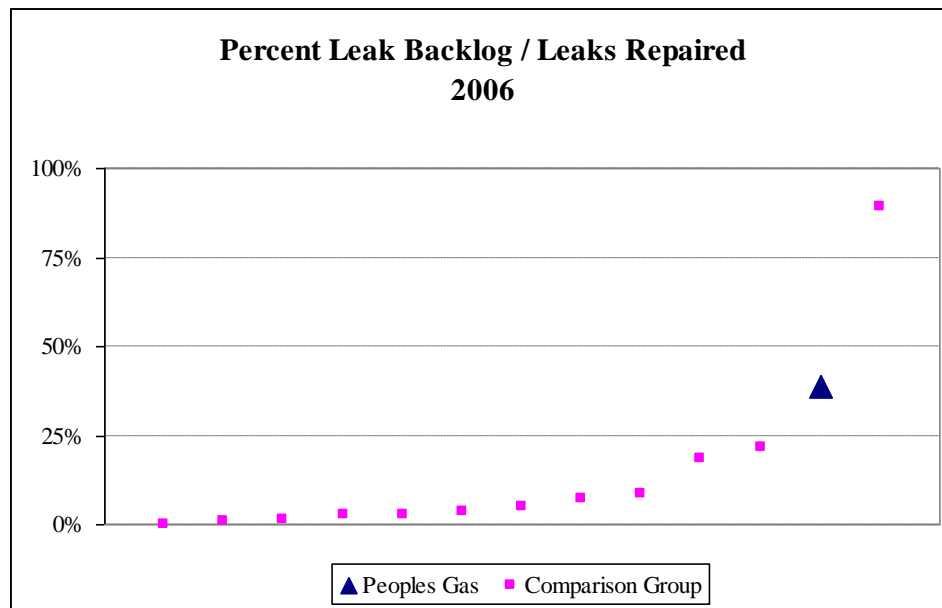


Peoples Gas’ service line leak repair rate from excavation damage is slightly higher than the peer group average. Peoples Gas’ damage rate to its service lines places it in the higher than average risk sector. This metric, taken together with PGL’s excavation damage rate per 100 miles of main is unacceptable, presenting a high risk to the public.

### f. Leak Backlog

The percent leak backlog per leaks repaired metric is a direct reflection of the risk posed to the public by allowing leaks to go unrepaired at year-end, a time when frost enters the ground and provides a greater risk of leaking gas migrating into habitable structures. Good operators reduce their leak backlog levels prior to frost conditions.

This metric compares the leak backlog with the actual leak repair efforts. The charts below show the number of known leaks at year-end scheduled for repair as a percentage of the total number of leaks repaired during the year. A higher number reflects poor repair numbers compared with leak backlogs. An acceptable performance number is in the low single digits.

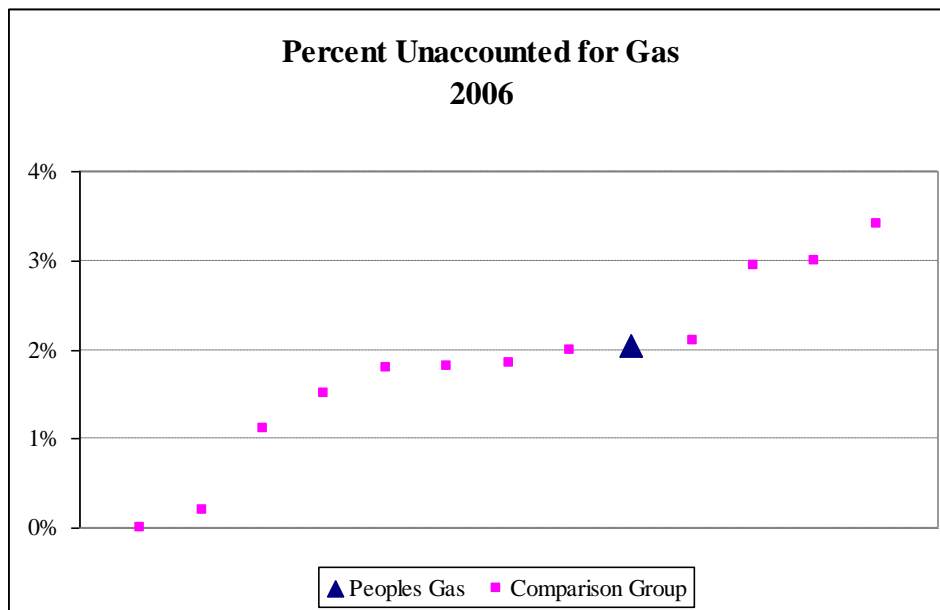


Peoples Gas' leak backlog performance presents an unacceptably high risk. To increase safety, Peoples Gas needs to reduce its backlog of leaks, *i.e.*, repair more leaks.

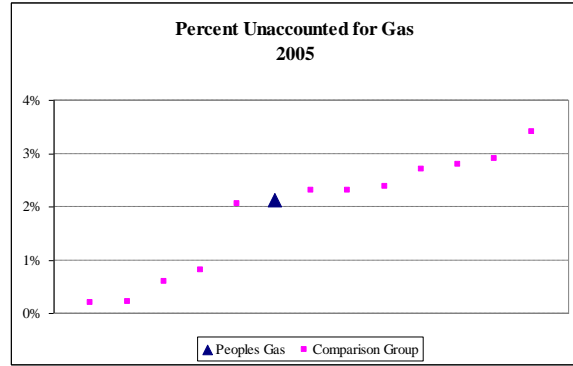
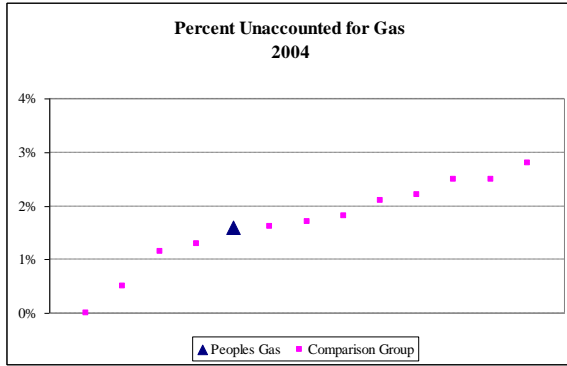
**g. Lost and Unaccounted for Gas**

Lost and unaccounted for (L&UF) gas is a measure of the difference between gas received and gas metered for sale. It typically includes losses due to leaks, unmetered theft, customer service losses (e.g., metered consumption for which there is no customer of record), metering error, conversion errors in converting pipeline energy deliveries to volumetric billing to most customers, and sometimes company use. Because leaks are typically one of the largest, if not the largest component of this category, it is a rough indicator of the condition of the system.

Utilities frequently do not have a good understanding of the components of this category, in part because they simply use it as a multiplier to billed volumes, providing little incentive for utilities to reduce it. Furthermore, several components of L&UF may be positive or negative (e.g., conversion from energy content to volumetric billing), and therefore may mask the actual behavior of the physical and administrative systems. Therefore, this metric is only as a very general indicator of the condition of the system. The charts below show the percentage of unaccounted for gas for Peoples Gas compared to the peer group, measured as a percent of total gas deliveries, as reported on annual leak reports to PHMSA on Form F7100.1-1.<sup>173</sup>



<sup>173</sup> The instructions for the form define L&UF as follows: (Purchased gas + produced gas) minus (customer use + company use + appropriate adjustments)] divided by (purchased gas + produced gas) equals percent unaccounted for.



Peoples Gas' reported level of lost and unaccounted for gas has remained at about 2 percent and is average for the peer group.

### 3. Conclusions

While clearly useful, there are many limitations to the use of comparative analyses. Liberty did not form specific conclusions based solely on the comparative analysis. However, taken together, Peoples Gas' leak repair rates from causes other than excavation damage, from excavation damage, and its leak backlog rates indicate poor performance relative to the peer group. Liberty uses this information in the development of conclusions and recommendations in other sections of this report.