

SUPPLEMENT 2

LP-Gas Systems Subject to DOT Pipeline Regulations

Editor's Note: This supplement provides designers, installers, operators, and regulatory officials of systems supplying LP-Gas vapor to multiple consumers with information on how both NFPA 58 and U.S. Department of Transportation (DOT) Pipeline Safety Regulations, Title 49, Code of Federal Regulations, Part 192, are administered by the Office of Pipeline Safety of DOT. The latter is referred to in this supplement as the DOT Pipeline Regulations. To be consistent with the term used by pipeline safety regulators, the multiple consumer systems that fall under both sets of regulations will be referred to as "jurisdictional systems."

The editor thanks Kenneth Wood, Partner of Education Training & Safety Associates, and Richard Marini, retired New Hampshire director of gas safety, who authored this supplement.

JURISDICTIONAL SYSTEM

For the purposes of this supplement, a jurisdictional system is a system that is under the jurisdiction of 49 CFR 192 [1] and NFPA 58. In June of 1996 changes to federal law, as stated in 49 CFR 192, simplified compliance for operators of these jurisdictional systems by clarifying the reference to NFPA 58 in these regulations.

Prior to 1996, NFPA 58 was referenced in the DOT Pipeline Regulations, but it was not clear where NFPA 58 applied. In 1996, the DOT Pipeline Regulations were revised to state that for LP-Gas systems, NFPA 58 supersedes the DOT Pipeline Regulations where they both cover the same subject. Where NFPA 58 is silent, the DOT Pipeline Regulations apply. This change was made in order to recognize that the DOT Pipeline Regulations were primarily intended to cover fuel distribution pipelines.

Many operators of multi-consumer LP-Gas systems have usually kept their systems small enough to avoid being under the jurisdiction of the DOT Pipeline Regulations. However, the 1996 changes to the DOT Pipeline Regulations make compliance easier. The additional requirements can also enhance safety.

An LP-Gas system is jurisdictional where one of the following conditions exists:

- Ten or more customers are supplied from a single tank or multiple tanks that are manifolded together. The location in this scenario does not matter.
- More than one customer is supplied from a single tank or multiple tanks that are manifolded together where a portion of the system is located in a public place.

The interpretation of public place by the Office of Pipeline Safety of DOT 49 CFR 192.1 is as follows:

The term public place in Section 192.1 means a place that is generally open to all persons in a community as opposed to being restricted to specific persons. DOT considers churches, schools, and commercial buildings, as well as any publicly owned right-of-way or property frequented by persons, to be public places.

An LP-Gas system is not jurisdictional where a single customer and the system are located entirely on the customer's premises, even if part of the system is located in a public place.

The following comments and exhibits clarify jurisdiction:

- A system that consists of a single LP-Gas tank supplying one residence is not jurisdictional, provided that no portion of the system is located in a public place other than on the customer's premises. NFPA 58 covers this typical residential installation.
- A system that consists of five mobile homes supplied by one LP-Gas tank in a mobile home park is not jurisdictional. NFPA 58 covers systems of fewer than 10 customers.
- A system that consists of 10 or more homes supplied by a single LP-Gas tank is jurisdictional. (See Exhibit S2.1.)



Jurisdictional system
10 or more customers
Location does not matter

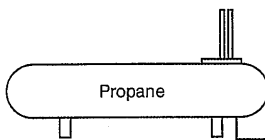


EXHIBIT S2.1 System Consisting of 10 or More Homes Supplied by a Single LP-Gas Tank.

- A system that consists of a single LP-Gas tank supplying more than one customer where the system is located in a public place (e.g., a parking lot) is jurisdictional. (See Exhibit S2.2.)
- A system that consists of two manifolded LP-Gas tanks supplying a restaurant where a portion of the system is located in a public place that is not part of the customer premises is jurisdictional. (See Exhibit S2.3.)

All jurisdictional systems must follow NFPA 58. In addition, the following plans are required by the DOT Pipeline Regulations.

PLANS REQUIRED BY THE DOT PIPELINE REGULATIONS

The DOT Pipeline Regulations and NFPA 58 require the operators of all jurisdictional systems to have plans for

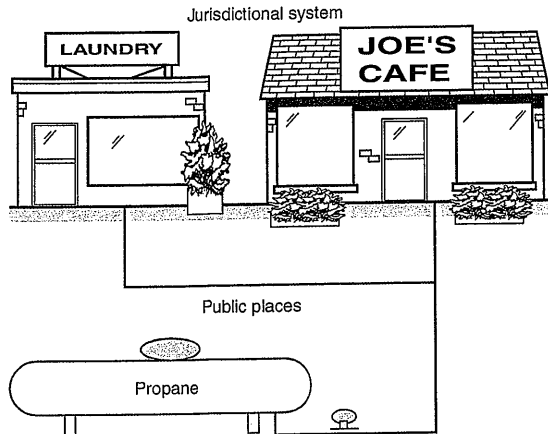


EXHIBIT S2.2 System Consisting of a Single LP-Gas Tank Supplying More Than One Customer Where the System Is Located in a Public Place.

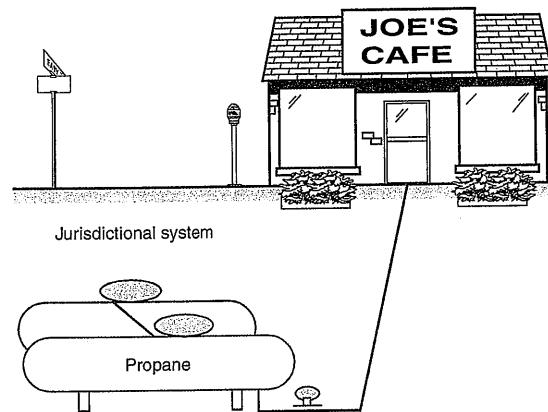


EXHIBIT S2.3 System Consisting of Two Manifolded LP-Gas Tanks Supplying a Restaurant Where a Portion of the System Is Located in a Public Place.

operations and maintenance and emergency response activities. Most operators of LP-Gas systems comply with this requirement by developing and maintaining one plan that covers both the operations and the maintenance of a facility. The plan must be prepared before operations on an LP-Gas system begin and must be updated once a year. The plan must be available at locations where operations and maintenance activities are conducted. The complete requirements for these plans can be found in the DOT Pipeline Regulations, 49 CFR 192.605 and 192.615 [1,2].

Note that inspectors from the Pipeline and Hazardous Materials Safety Administration (PHMSA) of DOT or

state agencies enforcing the DOT Pipeline Regulations can, after due process, require an LP-Gas operator to amend his or her plans to provide a reasonable level of safety.

Plans for Operations and Maintenance

The operations and maintenance plans required of all jurisdictional systems must be written, and they must be followed. All operations and maintenance plans must contain the following components:

1. *Investigation of Failures.* Procedures for analyzing accidents and failures in order to determine the cause and to minimize the probability of recurrence must be included.

2. *Operating Pressure.* The maximum operating pressure for an LP-Gas system must be identified. For small LP-Gas systems, this pressure is 20 psig (138 kPa) in most cases. Although higher pressures can be used, NFPA 58 requires that regulators use a 10 psig (69 kPa) interstage pressure. Higher pressures can be used for economy of pipe (i.e., the higher the pressure, the smaller the pipe). However, the minimum ambient temperature must be taken into account to prevent liquefaction of propane.

3. *Pressure Testing.* It is important to verify that systems are pressure tested to ensure that they do not leak and can safely operate within the intended pressure limits. This requirement is covered in Section 6.14 of NFPA 58. Procedures for pressure testing must be included in the plan.

4. *Tapping or Purging of Pipelines.* If tapping or purging is performed, those procedures must be included in the plan. Tapping is the addition of points of use, or taps, to an existing pipeline.

5. *Odorization.* A provision for the measurement of the odor of LP-Gas must be included. A "Bill of Lading" normally shows odorization of each transport or railroad car shipment. All transport or railroad car shipments delivered directly to a bulk plant must be checked for the presence of odorant by a sniff test or other means. For smaller systems that receive bobtail shipments of propane, a similar procedure to verify the presence of odorant must be included. This test can be as simple as smelling the gas periodically. Large jurisdictional systems, such as those serving a town distribution system, may require testing of certain areas of the distribution system to ensure that odorant can be readily detected at one-fifth of the lower flammable limit of LP-Gas.

6. *Patrolling.* Operators must include provisions for patrolling mains located in places, or on structures, where anticipated physical movement or external loading (e.g., weight, traffic) could cause failure or leakage. Patrolling is normally not necessary for small jurisdictional LP-Gas

systems. However, exceptions are possible, such as a system that has already experienced some of the noted problems.

7. *Leak Surveys.* Procedures for conducting an annual leak survey must be included. (See Compliance Actions later in this supplement.)

8. *Line Markers.* If the system crosses under a public road or railroad, markers can be required at each crossing point and where necessary to locate the line to reduce the possibility of damage or interference. Line markers are usually not required for most LP-Gas jurisdictional systems.

9. *Testing for Reinstating a Service Line.* A provision for testing each service line that has been disconnected from the main in the same manner as new service, before placing it back into service, must be included.

10. *Abandonment or Deactivation of Facilities.* Provisions for shutdown, abandonment, or inactivation of facilities must be included. When gas piping is abandoned, it must be physically disconnected at both ends, and the open ends must be sealed. In addition, the operator must determine if it is necessary to purge the line.

11. *Key Valve Maintenance.* Key valves, or critical valves, are the valves needed to shut down the system, or parts of the system, in case of emergency. In a small propane system, the tank valve is the key valve. In a larger system, the key valves are the container valve and valves that can shut off branches of the system. Annual maintenance of these valves must be included. (See Compliance Actions later in this supplement.)

12. *Accidental Ignition of Gas.* Provisions to prevent the accidental ignition of gas must be included. Propane is flammable when mixed with 2.15 percent to 9.6 percent air and will ignite where an ignition source is present. Every precaution must be taken to prevent unintentional ignition of propane. When venting propane, a fire extinguisher must be available and located for immediate use.

13. *Corrosion Protection.* Provisions for corrosion protection of underground metallic piping systems and underground tanks should be included. If only polyethylene pipe is used, no protection is needed. If underground tanks are used with a sacrificial cathodic protection system, measurements of the voltage should be conducted annually or at more frequent intervals. This action can be delegated to a consultant who has the appropriate qualifications and equipment. (See Compliance Actions later in this supplement.)

14. *Construction Records, Maps, and Operating History.* The operator must have construction records, maps, and operating history of the system and must follow procedures to make them available to operating personnel.

15. *Gathering of Data Needed for Reporting Incidents.* Procedures to compile information on pipeline incidents and safety-related conditions must be included. These procedures must ensure accurate and timely reporting. This information must be readily available.

16. *Startup and Shutdown of Any Part of the System.* Step-by-step procedures for the startup and shutdown of the system must be included, as well as procedures to be followed by operating personnel during an abnormal operating condition.

Emergency Plans

Each operator is required to keep a written plan of procedures used to respond to emergencies. The emergency plan should contain at minimum the following information. (See Exhibit S2.4.)

1. *Emergency Notification List.* The names and telephone numbers of the following personnel should be included:

- System operator
- Fire department
- Gas company
- Other entity whose service may be necessary in the event of an emergency

A copy of this list should be posted in a public area.

2. *Map of Key Valve Locations.* A map of the system showing the location of key valves must be included. A small system that supplies one facility from a single tank, where a portion of the system is located in a public place, must have a map showing the tank, pipeline, and customer location, with the tank valve identified as the key valve. A small system that supplies one facility from a single tank, where no portion of the system is located in a public place, must have a map showing the tank and the tank valve, and other key valves where present.

3. *Description and Location of Emergency Equipment.* The operator must determine what emergency equipment is needed and ensure that it is available. A description of the emergency equipment and its location must be included. Most operators of small LP-Gas systems serving a limited number of users may not have emergency equipment on site, but rely on their installer or propane supplier to provide emergency equipment when needed. In a small system, closing the tank valve will stop the escape of fuel and end an incident. Of course, quick action is needed to restore service to unaffected users, especially in winter. Where emergency equipment is not on site, its location and how to obtain it should be available on site.

4. *Response to Gas Leak Reports and Interruption of Gas Service.* The operator must have written procedures to

Checklist for a Major Emergency

- Fire department called
- Persons evacuated and affected area blockaded
- Local or regional police department notified
- Repair personnel notified
- Company call list executed
- Communication established
- Outside help requested
- Ambulances called if needed
- Leak shut off or brought under control
- Civil defense authorities notified
- Emergency valves or valves to shut down or reroute gas identified and located
- Individual service of each customer shut off (if an area has been cut off from a supply of gas)
- Situation under control and the possibility of recurrence eliminated
- Surrounding area, including buildings adjacent to and across streets, checked for the possibility of additional gas leakage, if appropriate
- Proper tag placed on affected meters
- Telephone report made to the state officials
- Telephone report made to the Office of Pipeline Safety
- Local radio station notified, if necessary

EXHIBIT S2.4 Sample Checklist for a Major Emergency.

be followed in response to gas leaks reported by customers. The operator's responsibility is to ensure that all employees are familiar with procedures for responding to gas leak calls and reports.

5. *Reporting Requirements (Telephone Reports).* In case of an incident, a telephone report must be made immediately to the National Response Center (800-424-8802). An incident is any event involving release of gas from a pipeline and the occurrence of any of the following:

- Death or injury requiring inpatient hospitalization
- Estimated property damage of \$50,000 or more
- Unusual occurrence that the operator deems necessary to report

The telephone report must be followed with a written report using DOT Form RSPA F 7100.1 and addressed to the Information Resources Manager, Office of Pipeline Safety, Research and Special Programs Administration Pipeline and Hazardous Materials Safety Administration, U.S. Department of Transportation, Room 7128, 400 Seventh Street, SW, Washington, DC 20590. The written report should be submitted as soon as practicable but no more than 30 days after the incident. Form RSPA F 7100.1 is reproduced here as Exhibit S2.5 and can be copied to file incident reports.

NOTICE: This report is required by 49 CFR Part 191. Failure to report can result in a civil penalty not to exceed \$100,000 for each violation for each day the violation continues up to a maximum of \$1,000,000 for any related series of violations as provided in 49 USC 60122.

Form Approved
OMB No. 2137-0522



U.S. Department of Transportation
Pipeline and Hazardous Materials Safety
Administration

INCIDENT REPORT - GAS DISTRIBUTION SYSTEM

Report Date _____
No. _____
(DOT Use Only)

INSTRUCTIONS

Important: Please read the separate instructions for completing this form before you begin. They clarify the information requested and provide specific examples. If you do not have a copy of the instructions, you can obtain one from the Office Of Pipeline Safety Web Page at <http://ops.dot.gov>.

PART A – GENERAL REPORT INFORMATION

Check: Original Report Supplemental Report Final Report

1. Operator Name and Address

- a. Operator's 5-digit Identification Number / / / /
- b. If Operator does not own the pipeline, enter Owner's 5-digit Identification Number / / / /
- c. Name of Operator _____
- d. Operator street address _____
- e. Operator address _____
City, County or Parish, State and Zip Code

2. Time and date of the incident

 / / / / /
hr. month day year

3. Incident Location

- a. _____
Street or nearest street or road
- b. _____
City and County or Parish
- c. _____
State and Zip Code
- d. Latitude: / / / / / Longitude: / / / / /
(if not available, see instructions for how to provide specific location)
- e. Class location description
 Class 1 Class 2 Class 3 Class 4
- f. Incident on Federal Land Yes No

4. Type of leak or rupture

- Leak: Pinhole Connection Failure (complete sec. F5)
 Puncture, diameter or cross section (inches) _____
- Rupture (if applicable):
 Circumferential – Separation
 Longitudinal
–Tear/Crack, length (inches) _____
–Propagation Length, total, both sides (feet) _____
- N/A
- Other: _____

5. Consequences (check and complete all that apply)

- a. Fatality Total number of people: / / / /
Employees: / / / / General Public: / / / /
Non-employee Contractors: / / / /
- b. Injury requiring inpatient hospitalization
Total number of people: / / / /
Employees: / / / / General Public: / / / /
Non-employee Contractors: / / / /
- c. Property damage/loss (estimated) Total \$ _____
Gas loss \$ _____ Operator damage \$ _____
Public/private property damage \$ _____
- d. Gas ignited Explosion No Explosion
- e. Gas did not ignite Explosion No Explosion
- f. Evacuation (general public only) / / / / people
Evacuation Reason:
 Unknown
 Emergency worker or public official ordered, precautionary
 Threat to the public
 Company policy
- 6. Elapsed time until area was made safe:
 / / hr. / / min.
- 7. Telephone Report
 / / / / /
NRC Report Number month day year
- 8. a. Estimated pressure at point and time of incident:
_____ PSIG
- b. Max. allowable operating pressure (MAOP): _____ PSIG
- c. MAOP established by:
 Test Pressure _____ psig
 49 CFR § 192.619 (a)(3)

PART B – PREPARER AND AUTHORIZED SIGNATURE

(type or print) Preparer's Name and Title Area Code and Telephone Number

Preparer's E-mail Address Area Code and Facsimile Number

Authorized Signature (type or print) Name and Title Date Area Code and Telephone Number

PART C - ORIGIN OF THE INCIDENT	
1. Incident occurred on <input type="radio"/> Main <input type="radio"/> Meter Set <input type="radio"/> Service Line <input type="radio"/> Other: _____ <input type="radio"/> Pressure Limiting and Regulating Facility	3. Material involved (pipe, fitting, or other component) <input type="radio"/> Steel <input type="radio"/> Cast/Wrought Iron <input type="radio"/> Polyethylene Plastic (complete all items that apply in a-c) <input type="radio"/> Other Plastic (complete all items that apply in a-c) Plastic failure was: <input type="checkbox"/> a. ductile <input type="checkbox"/> b. brittle <input type="checkbox"/> c. joint failure <input type="radio"/> Other material: _____
2. Failure occurred on <input type="radio"/> Body of pipe <input type="radio"/> Pipe Seam <input type="radio"/> Joint <input type="radio"/> Component <input type="radio"/> Other: _____	4. Year the pipe or component which failed was installed: <u> </u> / <u> </u> / <u> </u>
PART D - MATERIAL SPECIFICATION (if applicable)	
1. Nominal pipe size (NPS) <u> </u> / <u> </u> / <u> </u> in. 2. Wall thickness <u> </u> / <u> </u> / <u> </u> in. 3. Specification _____ SMYS <u> </u> / <u> </u> / <u> </u> / <u> </u> / <u> </u> / <u> </u> / <u> </u> / <u> </u> / <u> </u> / <u> </u> / <u> </u> / <u> </u> 4. Seam type _____ 5. Valve type _____ 6. Pipe or valve manufactured by _____ in year <u> </u> / <u> </u> / <u> </u>	
PART E - ENVIRONMENT	
1. Area of incident <input type="radio"/> In open ditch <input type="radio"/> Under pavement <input type="radio"/> Above ground <input type="radio"/> Under ground <input type="radio"/> Under water <input type="radio"/> Inside/under building <input type="radio"/> Other: _____ 2. Depth of cover: _____ inches	
PART F - APPARENT CAUSE	
Important: There are 25 numbered causes in this section. Check the box to the left of the primary cause of the incident. Check one circle in each of the supplemental items to the right of or below the cause you indicate. See the instructions for this form for guidance.	
F1 - CORROSION 1. <input type="checkbox"/> External Corrosion 2. <input type="checkbox"/> Internal Corrosion	If either F1 (1) External Corrosion, or F1 (2) Internal Corrosion is checked, complete all subparts a - e. a. Pipe Coating b. Visual Examination c. Cause of Corrosion <input type="radio"/> Bare <input type="radio"/> Localized Pitting <input type="radio"/> Galvanic <input type="radio"/> Stray Current <input type="radio"/> Coated <input type="radio"/> General Corrosion <input type="radio"/> Improper Cathodic Protection <input type="radio"/> Unknown <input type="radio"/> Other: _____ <input type="radio"/> Microbiological <input type="radio"/> Other: _____ d. Was corroded part of pipeline considered to be under cathodic protection prior to discovering incident? <input type="radio"/> No <input type="radio"/> Yes <input type="radio"/> Unknown Year Protection Started: <u> </u> / <u> </u> / <u> </u> / <u> </u> / <u> </u> e. Was pipe previously damaged in the area of corrosion? <input type="radio"/> No <input type="radio"/> Yes <input type="radio"/> Unknown How long prior to incident: <u> </u> / <u> </u> / <u> </u> years <u> </u> / <u> </u> / <u> </u> months
F2 - NATURAL FORCES	
3. <input type="checkbox"/> Earth Movement ⇒ <input type="radio"/> Earthquake <input type="radio"/> Subsidence <input type="radio"/> Landslide <input type="radio"/> Other: _____ 4. <input type="checkbox"/> Lightning 5. <input type="checkbox"/> Heavy Rains/Floods ⇒ <input type="radio"/> Washouts <input type="radio"/> Flotation <input type="radio"/> Mudslide <input type="radio"/> Scouring <input type="radio"/> Other: _____ 6. <input type="checkbox"/> Temperature ⇒ <input type="radio"/> Thermal stress <input type="radio"/> Frost heave <input type="radio"/> Frozen components <input type="radio"/> Other: _____ 7. <input type="checkbox"/> High Winds	
F3 - EXCAVATION	
8. <input type="checkbox"/> Operator Excavation Damage (including their contractors) / Not Third Party 9. <input type="checkbox"/> Third Party Excavation Damage (complete a-d) a. Excavator group <input type="radio"/> General Public <input type="radio"/> Government <input type="radio"/> Excavator other than Operator/subcontractor b. Type: <input type="radio"/> Road Work <input type="radio"/> Pipeline <input type="radio"/> Water <input type="radio"/> Electric <input type="radio"/> Sewer <input type="radio"/> Phone/Cable/Fiber <input type="radio"/> Landowner <input type="radio"/> Railroad <input type="radio"/> Building Construction <input type="radio"/> Other: _____ c. Did operator get prior notification of excavation activity? <input type="radio"/> No <input type="radio"/> Yes: Date received: <u> </u> / <u> </u> / <u> </u> mo. <u> </u> / <u> </u> / <u> </u> day <u> </u> / <u> </u> / <u> </u> yr. Notification received from: <input type="radio"/> One Call System <input type="radio"/> Excavator <input type="radio"/> General Contractor <input type="radio"/> Landowner d. Was pipeline marked? <input type="radio"/> No <input type="radio"/> Yes (If Yes, check applicable items i - iv) i. Temporary markings: <input type="radio"/> Flags <input type="radio"/> Stakes <input type="radio"/> Paint <input type="radio"/> Yes <input type="radio"/> No ii. Permanent markings: <input type="radio"/> Yes <input type="radio"/> No iii. Marks were (check one) <input type="radio"/> Accurate <input type="radio"/> Not Accurate iv. Were marks made within required time? <input type="radio"/> Yes <input type="radio"/> No	
F4 - OTHER OUTSIDE FORCE DAMAGE	
10. <input type="checkbox"/> Fire/Explosion as primary cause of failure ⇒ Fire/Explosion cause: <input type="radio"/> Man made <input type="radio"/> Natural Describe in Part G 11. <input type="checkbox"/> Car, truck or other vehicle not relating to excavation activity damaging pipe 12. <input type="checkbox"/> Rupture of Previously Damaged Pipe 13. <input type="checkbox"/> Vandalism	

F5 – MATERIAL OR WELDS

Material

14. Body of Pipe ⇒ Dent Gouge Wrinkle Bend Arc Burn Other: _____
15. Component ⇒ Valve Fitting Vessel Extruded Outlet Other: _____
16. Joint ⇒ Gasket O-Ring Threads Fusion Other: _____

Weld

17. Butt ⇒ Pipe Fabrication Other: _____
18. Fillet ⇒ Branch Hot Tap Fitting Repair Sleeve Other: _____
19. Pipe Seam ⇒ LF ERW DSAW Seamless Flash Weld Other: _____
- HF ERW SAW Spiral

Complete a-f if you indicate any cause in part F5.



a. Type of failure:

- Construction Defect ⇒ Poor Workmanship Procedure not followed Poor Construction Procedures
- Material Defect

b. Was failure due to pipe damage sustained in transportation to the construction or fabrication site? Yes No

c. Was part which leaked pressure tested before incident occurred? Yes, complete d-f, if known No

d. Date of test: / / mo. / / day / / yr.

e. Time held at test pressure: / / hr.

f. Estimated test pressure at point of incident: _____ PSIG

F6 – EQUIPMENT OR OPERATIONS

20. Malfunction of Control/Relief Equipment ⇒ Valve Instrumentation Pressure Regulator Other: _____
21. Threads Stripped, Broken Pipe Coupling ⇒ Nipples Valve Threads Mechanical Couplings Other: _____
22. Leaking Seals

23. Incorrect Operation

a. Type: Inadequate Procedures Inadequate Safety Practices Failure to Follow Procedures Other: _____

b. Number of employees involved in incident who failed post-incident drug test: / / / / Alcohol test: / / / /

c. Was person involved in incident qualified per OQ rule? Yes No d. Hours on duty for person involved: / / /

F7 – OTHER

24. Miscellaneous, describe: _____
25. Unknown
 Investigation Complete Still Under Investigation (submit a supplemental report when investigation is complete)

PART G – NARRATIVE DESCRIPTION OF FACTORS CONTRIBUTING TO THE EVENT (Attach additional sheets as necessary)

Blank area for narrative description of factors contributing to the event.

Note that LP-Gas operators should check with their state pipeline agency for state reporting requirements.

6. *Restoration of Gas Service After an Outage.* Qualified persons must follow proper procedures to safely restore gas service after an outage. These procedures should include details of appliance relighting procedures.

7. *Investigation Procedures.* Each operator must establish procedures for investigating incidents and failures, including the following:

- Evaluating the situation
- Protecting life and property
- Securing the area
- Conducting a leak survey
- Conducting meter and regulator checks
- Questioning persons on the scene
- Examining burn and debris patterns
- Testing odorization level
- Recording meter readings
- Recording weather conditions
- Selecting samples of the failed facility or equipment

Small LP-Gas systems not operated by an individual in the propane business will normally not have the ability to investigate accidents and will rely on their propane supplier or an outside contractor.

8. *Education and Training.* Operating personnel must be qualified to ensure understanding and competency in performance of emergency procedures.

ONE-CALL AND DAMAGE PREVENTION PROGRAM

LP-Gas operators that have jurisdictional systems must have a damage prevention plan and be members of, and participate in, a qualified one-call system to protect such systems from dig-ins. It is recommended that LP operators check with their state one-call systems to determine the laws and regulations that apply to them.

One-Call Systems

A one-call system provides a telephone communication link between excavators and operators of underground pipeline and facilities. The heart of the system is an operational center whose main function is to transfer information from excavators about their intended excavation activities to the operators of underground pipelines and facilities participating in the system. Excavators have to make only a single call to an operational center to start the process, thus the name "one-call." Upon receipt of the information, operators of pipelines and facilities that could be affected by the ex-

cavation activity arrange for the timely identification and marking of underground facilities that are in the vicinity of the intended activity. When necessary, the underground operators inspect the site being excavated and advise the excavator of the need for special measures to protect buried or exposed facilities. One-call notification systems may perform various other functions relevant to protecting underground pipelines and facilities from damage, such as record keeping and public awareness programs.

Excavation

Excavation activities must not be conducted without first ascertaining the location of all underground facilities that could be affected by the excavation. Excavation activities include excavation, blasting, boring, tunneling, backfilling, and other earth-moving operations, as well as the removal of aboveground structures by either explosive or mechanical means.

Prior to any excavation, each excavator must serve notice of intent to excavate to the One-Call Center serving the area in which the proposed excavation will occur. Notice must be given to the local One-Call Center in accordance with state regulations in advance of excavation. This requirement may vary from 24 to 72 hours, excluding weekends and holidays.

EMERGENCY EXCAVATION

An emergency excavation is an excavation performed to eliminate an imminent danger to life, health, or property. Telephone notification of the emergency excavation must be given as soon as possible to the One-Call Center. If necessary, emergency assistance should be requested from each operator to locate and protect its underground facilities.

OPERATOR QUALIFICATION

All operators of jurisdictional LP-Gas systems were required to have a written operator qualification program in place by April 27, 2001. By October 28, 2002, all employees performing covered tasks were required to be qualified to meet the requirements of 49 CFR 192 N of the federal pipeline safety regulations.

General Requirements

The operator must

- Identify covered tasks
- Determine who must be qualified
- Determine the method of qualification
- Determine requalification procedures
- Keep records

Covered Tasks

A covered task is an activity identified by the operator that fulfills all of the following four characteristics:

1. It is performed on a pipeline facility.
2. It is an operations or maintenance task. (Note: This task includes an emergency response.)
3. It is performed as a requirement of 49 CFR 192 of the federal pipeline safety regulations.
4. It affects the operation or integrity of the pipeline.

Covered tasks in a typical small LP-Gas system include the following:

- Installing regulators and meter sets
- Testing service lines
- Protecting against corrosion (underground and atmospheric)
- Joining plastic pipe or tubing with mechanical fittings
- Purging pipelines
- Making permanent repairs
- Locating and marking facilities
- Performing leak surveys
- Tapping pipelines under pressure
- Purging pipelines
- Abandoning pipelines
- Operating and maintaining vaporizers

These tasks can be carried out by the operator, contractor, or gas supplier.

Operator Qualification Program

The written qualification program must include provisions that accomplish the following:

- Identify covered tasks
- Ensure that individuals are qualified
- Allow unqualified individuals to perform a covered task while under the observation of a qualified individual
- Evaluate the individual's qualifications in the event of an incident
- Evaluate the individual if there is reason to believe that the individual is no longer qualified
- Inform the qualified individual of any changes affecting the covered task
- Establish a plan that provides adequate training for performing covered tasks safely and, if any significant changes are made to the plan, inform the state agency
- Determine intervals for requalification

Record Keeping

Qualification records must be maintained as long as the individual is performing the covered task. Records of indi-

viduals no longer performing a covered task must be kept for five years.

Records must include the following information:

- Identification of qualified individuals
- Covered tasks the individual is qualified to perform
- Date of current qualification
- Qualification method

COMPLIANCE ACTIONS

The following are some of the commonly used methods of compliance with DOT regulations. State pipeline regulations and 49 CFR 192 should always be referenced, to ensure compliance. Local pipeline regulatory officials can assist in understanding these regulations.

Leak Surveys

Leak surveys are part of periodic maintenance. Leak surveys using leak detection equipment must be conducted in business districts such as shopping malls. The surveys should include 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. These tests should be performed annually, but at intervals not exceeding 15 months. Leak surveys with leak detector equipment must be conducted outside business districts as frequently as necessary, but at intervals not exceeding 5 years.

Some operators are currently being allowed to use the pressure drop test method for compliance of their systems. It is important to remember that if any drop occurs, gas detection equipment is almost always needed to pinpoint the leak. Other factors to consider when doing a pressure drop test are the volume of the piping system being tested, the time duration necessary for performing an adequate test after considering the volume, and the accuracy of the instrument or gauge used during the test.

LP-Gas system surveys using gas detection equipment must include a subsurface survey where underground piping is a part of the system. This survey is usually done with a special tool, a bar hammer, that is used to make a hole for sampling. Both flame ionization detectors and combustible gas indicators can be used to determine whether gas is present. If any leak is found, equipment that gives a numerical reading must be used to determine the seriousness and location of the leak from multiple test holes.

Cathodic Protection of Underground Piping

Each system that is cathodically protected must be tested annually, but at intervals not exceeding 15 months, to determine whether the cathodic protection is adequate. Crite-

ria to ensure that cathodic protection is adequate can be found in Appendix D of 49 CFR 192. A commonly used method for LP-Gas systems is determining whether a negative (cathodic) voltage of at least 0.85 volt, with reference to a saturated copper-copper sulfate half cell, exists between the pipe or underground tank and remote earth. A special voltage meter, called a half-cell potential meter, is required to conduct this test.

Protection Against Atmospheric Corrosion of Aboveground Piping

Steel pipelines exposed to the atmosphere must be cleaned and either coated or jacketed for the prevention of atmospheric corrosion. A durable paint is the usual protective system used for LP-Gas piping. Aboveground piping should be inspected during other routine maintenance to reevaluate each pipeline that is exposed to the atmosphere. Remedial action must be taken when it is necessary to maintain protection against atmospheric corrosion.

Key Valves and Their Maintenance

Each valve, the use of which can be necessary for the safe operation of a distribution system, must be checked and serviced at intervals annually, but at intervals not exceeding 15 months. Maintenance usually includes operating the valve to verify that it is operable and does stop the flow of gas and checking the valve for leakage. Appropriate replacements, repairs, or adjustments should be made as needed. In small LP-Gas systems, the key valves are generally tank valves. Larger LP-Gas systems may have other key valves to isolate a section of the main system in the event of an emergency.

First-Stage Regulator Maintenance

The first-stage regulator must be inspected and tested annually, but at intervals not exceeding 15 months, to determine the following:

- It is in good mechanical condition.
- It is adequate for the capacity of the system.
- It is set to function at the correct pressure.
- It is properly installed and protected from dirt, liquids, or conditions that could prevent proper operation.

A lockup test is one method used for compliance with these requirements.

NFPA 58 requires that two-stage pressure regulation be installed to provide system overpressure protection. The use of two-stage pressure regulation and the requirement of the first-stage regulator to have overpressure protection as required by UL 144, *Standard for LP-Gas Regulators*, provide a safe and simple alternative to the requirements of

the DOT Pipeline Regulations for overpressure protection [3]. NFPA 58 requires an interstage pressure of 10 psi (69 kPa). If a higher pressure is desired, it can be achieved without compromising safety by using a three-stage system, with the first stage at a pressure higher than 10 psi, the second stage at 10 psi, and the final stage at 11 in. w.c.

Record Keeping

Operators may use any record-keeping method that produces authentic records. The data constituting these records should be retained in a medium that has a life expectancy at least equal to the specified retention period. The retention period varies by state.

Operators must keep records necessary to administer the procedures established in their operations and maintenance manual. Some of the record-keeping requirements are listed as follows:

- *Pressure Test Records.* Initial pressure test records should be kept for the useful life of the system. The operator's name, the name of the employee or contractor responsible for conducting the test, the test medium used, the test pressure, and the test duration should all be recorded.
- *Cathodic Protection Records.* Records of the cathodic protection method used to protect underground tanks and piping must be maintained for the life of the system. Each test, survey, or inspection required by the DOT Pipeline Regulations should be recorded in sufficient detail to demonstrate the adequacy of corrosion control measures or that a corrosion condition does not exist. (If there are no underground tanks and the piping is polyethylene, no cathodic protection systems are required, and this requirement is not applicable.)
- *Emergency Plan Training Records.* The system operator must train appropriate operating personnel to ensure that they are knowledgeable in the emergency procedures and to verify that the training is effective.

The records can be as simple as a bound notebook in which all maintenance, abnormal operations, and system changes are recorded.

Annual Unaccounted for Gas Report (100 or More Customers)

LP-Gas systems serving 100 or more customers from a single source are required to file an annual report. Part of this report must be the system's percentage of unaccounted for gas. Unaccounted for gas is the difference between the amount of propane delivered into the system and the amount that is recorded through the customer's meters.

Unaccounted for gas can be caused by measurement and control errors, system leakage, and theft.

Temperature and pressure affect gas density. For this reason, temperature-compensating meters are widely used. For customers with high gas usage, the meter can be located upstream of the second-stage pressure regulator so that a smaller (less costly) meter can be used. Where the meter is located upstream of the second-stage pressure regulator, a constant pressure must be maintained. Otherwise, meter readings will not be accurate, which can lead to unaccounted for gas. Pressure-compensating meters are available. The better the control on gas measurement, the easier it is to spot problems in other areas that affect unaccounted for gas.

STATE PIPELINE SAFETY PROGRAM MANAGERS

A list of state pipeline safety program managers with their contact information can be downloaded from the fol-

lowing link: <http://www.phmsa.dot.gov/staticfiles/PHMSA/DownloadableFiles/appendxa-slp-gassystems.htm>.

Note that operators of LP-Gas jurisdictional systems are required to belong to a qualified one-call notification system for protecting their systems from construction damage. In addition, the operators must also have a written damage prevention program to protect the systems against damage from "excavation activities." The state pipeline safety program managers can provide specific information on one-call notification systems in their respective states.

REFERENCES CITED

1. Title 49, Code of Federal Regulations, Part 192.605, U.S. Government Printing Office, Washington, DC.
2. Title 49, Code of Federal Regulations, Part 192.615, U.S. Government Printing Office, Washington, DC.
3. UL 144, *Standard for LP-Gas Regulators*, 1999 edition, Underwriters Laboratories Inc., Northbrook, IL.