



STANDARD PRACTICE

STANDARD PRACTICE NO. 460.21-4

ISSUING DEPARTMENT GAS DISTRIBUTION

PAGE NO 1 (of) 2 EFFECTIVE 12/31/90

CORPORATE OFFICER GAS & ELECTRIC TECHNICAL SERVICES

REPLACING ALL
PAGE NO (of) EFFECTIVE 7/30/90

SUBJECT:

PERIODIC LEAK SURVEYS OF GAS TRANSMISSION AND DISTRIBUTION FACILITIES

PURPOSE

To establish a uniform requirement for the performance of gas leak surveys of Company pipelines, buried station piping, mains and services for the purpose of detecting and reporting leakage; and thereby establish a system of records.

POLICY

Leak surveys shall be conducted at regular intervals throughout the gas transmission and distribution systems. It is the Company's policy to search for, evaluate and control gas leakage in the interests of safety and efficiency of operation.

RESPONSIBILITY

The responsibility for performance of gas leak surveys and records for the Transmission and Distribution facilities, shall rest with the Division, Gas Transmission and Storage or Region Transmission and Substation, Supervisor who directs the maintenance and operation of the facilities.

REFERENCES

- S.P. 403-2, "Request for Information Concerning the Location of Company-owned Facilities"
- S.P. 449-1, "Rules for Working Near Underground Electric Cables"
- S.P. 460.2-1, "Patrolling Pipelines and Mains"
- S.P. 460.2-2, "Physical Inspection: Pipelines, Mains and Services"
- S.P. 460.21-2, "Clock Testing and Soap Testing for Leaks"
- S.P. 460.21-3, "Investigating Gas Leaks on Customer's Premises"
- S.P. 460.21-5, "Work Procedures for Gas Department Employees in Confined Spaces"
- S.P. 460.21-8, "Fumigation"
- S.P. 463.7, "Pipeline History File, Establishing and Maintaining"
- S.P. 463.8, "Maximum Operating Pressures of Pipelines & Mains Operating At Or Over 20% SMYS"
- S.P. 851-2, "Use of Customer Service Tag and Field Service Tag"
- GS&S M-53, "Portable Combustible Gas Indicator"
- C.P.U.C. General Order 112-D.
- GS&S A34, "Design and Test Requirements"
- GS&S A34.2, "Upgrading Procedures - Low to High Pressure"

*Paragraph Revised (Portions Underlined)
**Paragraph Added



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The procedural details of the gas leak survey program appear in the supplement to this Standard Practice.

FOR FURTHER INFORMATION

For additional information or copies on this Standard Practice please contact the Gas Engineer in Gas and Electric Distribution on extension 223-4813.

APPROVED BY

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*Paragraph Revised (Portions Underlined)
**Paragraph Added

TABLE OF CONTENTS

| | <u>PAGE</u> |
|--|-------------|
| 1. Definition of Terms | 1-2 |
| 2. Priorities | 2 |
| 3. Leak Grades: Initial Report, Response, Action | 3-5 |
| a. Grade 1 | 3-4 |
| b. Grade 2 | 4 |
| c. Grade 3 | 5 |
| 4. Leak Survey, General | 5 |
| 5. Frequency of Periodic Leak Surveys | 6-7 |
| a. Annually | 6 |
| b. Every Three Years | 6 |
| c. Every Five Years | 6 |
| d. After Leak Repairs | 6 |
| e. Before and During Projects Involving Tunnel and Confined Space-type Construction | 7 |
| 6. Leak Survey Methods | 7-9 |
| a. Mobile Type Survey | 7 |
| b. Foot Survey | 7 |
| c. Vegetation Survey | 8 |
| d. Special Leak Surveys | 8-9 |
| 7. Records and Reports | 9-11 |
| a.- k. Route Books and Records | 9-10 |
| l.- n. Maintenance of Records | 11 |
| o. Review | 11 |
| p. Audits | 11 |
| 8. Volatile Combustible Material In Soil | 11-12 |

DEFINITIONS

1. The following definitions shall apply to this Standard Practice:
 - a. Class Locations: An area defined and classified by set criteria. See Section 192.5 of the C.P.U.C. General Order 112-D.
 - b. Station Piping: For the purpose of leak surveying, this includes all underground gas pipes and appurtenances within the property lines of compressor stations, terminals, storage holder facilities regulator stations and other gas operating installations.
 - c. Gas Facilities: Company operated gas lines, including gas mains, service lines, pipelines, and related appurtenances.
 - d. Leak Survey: A search for possible gas leakage in any area where gas facilities exist, or where a gas leak is reported or suspected.
 - e. Leak: The unintentional escape of gas from containment.
 - f. LEL: The lower explosive limit, expressed as a percentage by volume of gas in air at standard conditions.
 - g. Gas Detector: An instrument capable of detecting and measuring the percentage concentration of combustible gas in air. (Includes infra-red, flame-ionization and filament-bridge type gas detection indicators.)
 - h. Building: Any structure used for human occupancy in which gas could accumulate.
 - i. Tunnel: A subsurface passageway in which a person could enter and gas could accumulate. For purposes of this Standard Practice, "tunnel" also includes sewers, storm drains, pipelines, conduits, etc.
 - j. Confined Space: Any structure of sufficient size that could accommodate a person and where gas could accumulate, e.g. vaults, manholes, etc., or where ventilation, entrance and exit is limited.
 - k. Reading: A repeated measurement of gas indicated on a gas detector. Where the reading is in a confined space, consideration should be given to the rate of dissipation when the space is opened or ventilated for the test and the rate of accumulation when the space is closed.
 - l. Transmission Line: All lines in transmission capital and distribution lines operating at or over 20% SMYS (described in G.O. 112D 192.3 Definitions)
 - m. Substructure: Any structure, tunnel, passageway, or other confined space below ground level where gas could accumulate.
 - n. Combustible Material: A flammable gaseous material consisting of organic compounds, e.g., methane, benzene, etc.

- o. Distribution Main: A distribution line that serves as a common source of supply for more than one service line.
- p. Gathering Line: A pipeline that transports gas from a current production facility to a transmission line or main.
- r. Service: A distribution line that transports gas from a common source of supply to a customer meter.
- s. Leak Grades:
 - (1) A Grade 1 leak represents an existing or probable hazard to persons or property requiring immediate repair or continuous action until conditions are no longer hazardous.
 - (2) A Grade 2 leak is one that is not hazardous to life and property at the time of detection, but requires scheduled repair based on probable future hazard.
 - (3) A Grade 3 leak is one that is non-hazardous at the time of detection and can reasonably be expected to remain non-hazardous.

PRIORITIES

- 2.a. Surveillance and repair priority shall be based on such factors as:
 - (1) The volume, gas-air concentration, and type of escaping gas (for handling unknown of gas sources see Volatile Combustible Material In Soil, section 8)
 - (2) The size and occupancy of the area where leakage could occur, and the proximity to structures, both above and below ground.
 - (3) The presence of any type of channel or tunnel that could affect the migration or accumulation of gas underground.
 - (4) Soil and surface conditions that influence #3 above.
 - (5) The proximity to sources of ignition.
 - (6) Public awareness, apprehension and reaction to the leak situation.
 - (7) Soil movement caused by landslides, earthquakes, etc., where external stresses on the pipeline may cause leakage.
- b. After consideration of such factors, repair priority shall be in the order of Grade 1, Grade 2 and Grade 3.

LEAK GRADES: INITIAL REPORT, RESPONSE, ACTION

3.a. Grade 1

- (1) Initial Report (by Leak Surveyor or other qualified personnel)
 - (i) Any reading in or under a building or tunnel.
 - (ii) Any reading of 80% LEL (4% gas in air, 40,000 ppm) or greater in a confined space. (See Section 6j and 6k.)
 - (iii) Any reading at the outside wall of a building or where gas would likely migrate to the outside wall of a building.
 - (iv) Any reading of 80% LEL or greater in a non-gas substructure where the gas would likely migrate to the outside wall of a building.
 - (v) Escaping gas that has ignited.
 - (vi) Gas which can be seen, heard, or felt in a location where the presence of gas may endanger the general public or property.
 - (vii) A gas leak reported by other than Company or Company-contracted personnel.
 - (viii) A gas leak which in the judgment of the surveyor or supervisor is an immediate hazard.
- (2) Response (by Leak Surveyor or other qualified personnel)

Investigate without delay.
- (3) Action
 - (i) Take immediate action to eliminate the hazard. Such action may include (but is not limited to) one or more of the following:
 - (a) Evacuate premises.
 - (b) Vent the leakage.
 - (c) Remove sources of ignition.
 - (d) If burning, prevent spread of fire but not necessarily extinguish burning gas.
 - (e) Shutdown of facilities including area (zone) shutoff.
 - (f) Restrict public access to area.
 - (g) Re-route traffic, block railroads.

- (ii) Repair Leak within 24 hours
- (iii) Downgrade from No. 1 and set repair priority if immediate repair is not required.

b. Grade 2

(1) Initial Report (by Leak Surveyor or other qualified personnel)

- (i) Any reading of 40% LEL (2% gas in air, 20,000 ppm) or greater under sidewalk in a wall-to-wall paved area which does not qualify as a Grade 1 leak.
- (ii) Any reading of 100% LEL (5% gas in air, 50,000 ppm) or greater under street in a wall-to-wall paved area which does not qualify as a Grade 1 leak.
- (iii) Any reading less than 80% LEL in a non-gas substructure where gas would likely migrate, creating a probable future hazard.
- (iv) Any reading between 20% LEL and 80% LEL in a confined space.
- (v) Any reading of 80% LEL or greater in a small gas-associated substructure not covered in 8 (a)(1)(IV), or which does not qualify as a Grade 1 leak.
- (vi) Any reading on a pipeline operating at 30% of specified minimum yield strength or greater in a Class 3 or 4 location which does not qualify as a Grade 1 leak.
- (vii) Any leak which, under frozen or other adverse soil conditions, would likely migrate to the outside wall of a building.
- (viii) Any leak which in the judgment of personnel at the scene is of sufficient magnitude to justify scheduled repair.

(2) Response

Investigate at earliest opportunity.

(3) Action

- (i) Repair or clear within one year but no later than 15 months from the date reported; or ahead of ground freezing or other adverse changes in venting conditions. Maintain surveillance prior to repair at intervals not exceeding six months.
- (ii) Establish repair priority and surveillance interval, based on conditions such as described in Section 2.a.
- (iii) Downgrade to No. 3 if non-hazardous and can reasonably be expected to remain so.

c. Grade 3

(1) Initial Report (by Leak Surveyor or other qualified personnel)

- (i) Any reading under street in a non-wall-to-wall paved area which does not qualify as a Grade 1 or Grade 2 leak and where it is unlikely that gas could migrate to the outside wall of a building.
- (ii) Any reading of less than 20% LEL in a confined space.
- (iii) Any reading of less than 80% LEL in a small gas associated substructure.
- (iv) All other leaks which are non-hazardous at the time of detection and can reasonably be expected to remain non-hazardous.

(2) Response

Recheck during next scheduled survey, or within 15 months of the reporting date, whichever occurs first, until the leak is regraded or no longer results in a reading.

LEAK SURVEY, GENERAL

- 4.a. The great variety of conditions encountered in the Company's gas system precludes the establishment of a procedure subject to literal application in every situation. The procedures outlined are intended as guidelines to be used as minimum standards wherever applicable. Although these procedures will be found to be applicable in the majority of cases, particular situations wherein they would not be applicable will still require the exercise of sound judgment in carrying out an effective leak survey program.
- b. Odors or indications from foreign sources. (See Volatile Combustible Material In Soil, section 8) When leak indications are found to originate from a foreign source or facility, such as gasoline vapors, sewer or marsh gas, prompt action should be taken where necessary to protect life and property. Leaks that are potentially hazardous should be reported promptly to the operator of the facility and, where appropriate, to the police department, fire department or other governmental agencies.
- c. For leaks on customer's premises, refer to S.P. No. 460.21-3, "Investigating Gas Leaks on Customer's Premises", and S.P. No.460.21-8, "Fumigation."

FREQUENCY OF PERIODIC LEAK SURVEYS

*5.a. Annually (in the period from the month preceding to the month following the anniversary date) where any one of following apply:

- (1) Gas facilities in Class 4 locations, in principal business districts, or in other comparable areas where wall-to-wall paving or other conditions prevent gas from venting to atmosphere.
- (2) Gas facilities in Class 3 locations covered by Paragraph 192.5(d) and , General Order No. 112-D, where, in the opinion of the supervisor, conditions warrant annual survey. This may include certain public assembly buildings occupied by 20 or more persons, outdoor theaters, recreation areas, etc. In all cases, schools, hospitals, business districts and churches must be surveyed annually.
- (3) All transmission lines are operating at 20% SMYS or over.
- (4) Gas facilities are transporting unodorized gas in Class 1 or 2 locations.
- (5) Gas facilities located in or adjacent to basements of large buildings where traditional or scheduled events (e.g., Christmas holiday season, political conventions, etc.) may attract unusually large crowds. (This condition will require a survey of basements in addition to other area coverage that may be required by this Standard Practice, but does not preclude running such surveys concurrently, provided they can both be performed within a reasonably short time before the holiday season or other event.)
- (6) All other feeder mains in Class 3 and 4 locations.

*b. Every three years (within the month of the previous survey)

- (1) All buried station piping.
- (2) Gas Distribution facilities not cathodically protected.

*c. Every five years (within the month of the previous survey)

The balance of all underground gas facilities must be surveyed for leakage at five-year intervals or less, as circumstances may warrant, and within the bounds of efficient operation.

d. After leak repairs

The need for a follow-up survey after repair should be determined by a qualified employee, under the direction of the supervisor in charge of maintenance, based on such factors as residual gas, leak history, age, condition and type of system.

*Revision

e. Before and during projects involving tunnel and confined space-type construction (See Sections 6i, 6j and 6n.)

- (1) Gas facilities in areas in which such projects are scheduled for construction shall be leak surveyed within 3 months prior to the start of project.
 - (i) All Grade 1 and 2 leak indications are to be cleared prior to start of the project.
 - (ii) All Grade 3 leak indications are to be verified by bar-hole and substructure testing as well as by surface testing. Such indications are to be cleared prior to start of the project when there is evidence of migration or likely migration of gas to the construction site. (See Volatile Combustible Material in Soil).
- (2) Surveys such as those described in Special Leak Survey, Part 2, are to be conducted at regular intervals during construction. Frequency will depend on such factors as type, age and condition of pipe, leak history, contractor's construction methods, and proximity of new substructures to Company facilities.
- (3) Should damage to a gas facility occur during construction, immediate action shall be taken to control the escape of gas, including post-repair surveys to assure that no further leakage exists and that tunnels and confined spaces are clear of readings.
- (4) Surveying may be combined with the procedures described in Standard Practice 403-2, "Request for Information Concerning the Location of Company-Owned Facilities."

LEAK SURVEY METHODS

6. Following are the acceptable methods of gas leak survey:

a. Mobile Type Survey:

- (1) Annual, three-year and five-year areas:
 - (i) Survey rights-of-way, alleys, easements and streets where gas facilities are located, at a speed no faster than 400 feet per minute (4.5 mph).

b. Foot Survey:

- (1) Annual, three-year and five-year areas:
 - (i) Survey is normally to be conducted by using a portable hydrogen flame ionization instrument, or other combustible gas indicator of the filament-bridge type, either hand-bulb aspirated or motor-pumped. Exposed facilities may be tested with leak detection fluid (soap, etc.).

- (ii) Foot survey method may be used to test mains in street or other vehicular areas where safe, effective coverage is possible and it is more practical and economical than mobile survey. In urban sections this can generally be accomplished by scanning the curb-gutter area with the flame ionization intake, and by surveying pavement cracks and substructures.
- (2) Survey Procedures:
- (i) Survey at exposed piping, at surface openings, pavement cracks and joints, unpaved areas; or at other locations where gas may vent.
 - (ii) Survey over all services and meter sets. *(including inside customer building)*
 - (iii) At one-year locations described in Section 5.a(1), install permanent test station if there are insufficient surface openings.
 - (iv) At one-year locations described in Section 5.a(5), survey meter sets within buildings, at pipe entering through basement walls and at other possible sources of gas leakage.
- c. Vegetation Survey: (Visual surveillance of vegetation along the route of buried gas facilities by experienced personnel.)
- (1) Can be used as a leak survey method in conjunction with other methods and it may be used for Class 1 locations. It may be used as a principal method in Class 2 locations, provided gas detectors are available for verification of findings.
 - (2) May be performed by foot, vehicle or aerial patrol.
- d. Special Leak Surveys:
- (1) Purpose: There are special surveys that may be initiated for a variety of reasons. Examples are:
 - (i) Further and more detailed surveys to pinpoint leakage found on Routine Leak Surveys.
 - (ii) Customer or third party complaints of leakage.
 - (iii) To obtain pipe condition information ahead of street improvements.
 - (iv) Safety control during operating pressure conversions. (See GS&S Section 34.2)
 - (v) Surveying major construction projects where large trench, chamber or vault excavations are made, or as required by Section 5.e.

- (vi) Suspected leakage or questionable conditions.
 - (vii) All Company gas facilities in the vicinity of a fumigation.
 - (viii) Following an earthquake, landslide, etc., pipelines located in areas showing significant soil movement should be leak surveyed periodically until the supervisor feels the areas are considered the area to be non-hazardous to the public.
- (2) Survey Procedures: One or more of the following are to be included in search procedures:
- (i) Conduct survey with portable gas leak detector in and around buildings or homes, at foundation vents, at meter service riser bends, at sewer vents on buildings or homes, or in substructures and excavations, and take such other appropriate actions necessary to control the hazard.
 - (ii) Make bar tests at suitable intervals to determine points of leakage. Note: Wherever possible, bar testing should be preceded by surface tests with flame ionization or equivalent instruments, as a means of reducing the number of test holes required.
 - (iii) Where leakage exists, consideration shall be given to surveying at points where gas facilities cross building or home sewer laterals.
 - (iv) Consult soil condition map, and where conditions are severe such as wet adobe, special care shall be exercised to select reliable test methods. If required, bar testing or excavations or both shall be made to or below the gas main or service taking suitable precautions to avoid damage to other utility facilities. In vicinity of electric underground facilities, construction practices outlined in Standard Practice 449-1, Section 5.b., are to be followed.

RECORDS AND REPORTS

7. Following are the records and reports to be made in conjunction with leakage inspection procedures:
- a. Route books or folders, made up of the appropriate records indicating the established survey frequency, shall be prepared and maintained in each Division or headquarters.
 - b. For the surveys contemplated under Paragraph 5.a(2) special route books or other suitable records system shall be prepared.
 - c. Blocks of leak numbers are to be assigned by the Division to all Company and contractor personnel reporting leakage.

- d. All leak indications are to be recorded on the Leak Survey Log, Leak Survey, Inspection and Repair Report Form C or equivalent forms and turned in daily to the operating headquarters. Indications requiring prompt action shall be phoned or otherwise given to the designated operating supervisor as such indications are found or reported.
- e. The PC Gas Leak Program will be utilized to allow the automatic transfer of the Leak Survey Log and the Leak Survey Inspection and Repair Report information to the Mainframe Leak Survey Database.
- f. Leak numbers should not normally be assigned to above-ground meter set leaks. The record of repair shall be kept on customer service tags or field service tags as specified in Standard Practice 851-2.
- g. Completed record copies are to be turned in to the operating headquarters with the following information:
 - (1) Dates surveyed, main footage and number of services; survey method; by whom.
 - (2) Evidence that all main and services have been tested, by tracing over main and check-marking services or otherwise indicating on each record all facilities have been tested.
 - (3) Location of all leak indications found, and numbers assigned.
 - (4) Plat sheet corrections required, as determined by inspection in the field.
- h. Leak Survey, Inspection and Repair Report - Form #62-4060A (Rev. 10/89), is to be used to record computer input data, and all information relative to survey findings, main condition and repair. Pipeline, main and service inspection records are to be maintained in accordance with Standard Practice 460.2-2.
- i. Leak Survey, Inspection and Repair Report - Form #62-4058C (Rev. 7/84) or Form A, is to be used to update existing Masterfile Records.
- j. Action taken to mitigate reported leakage shall be recorded and filed with Form A.
- k. Records of leaks discovered and routine leak surveys shall be retained as follows:
 - (1) For transmission mains, the records shall be kept on file as long as that section of main involved remains in service, plus six years.
 - (2) For all other lines, the records shall be kept for the current and immediately preceding survey. (Form A is to be kept for the life of the facility).

- l. Inspection records, in connection with leak repair or other pipe exposure shall be maintained for the life of the facility (S.P. 460.2-2, Section 13).
- m. In each office where route books are kept, survey schedules shall be established, to bring to the supervisor's attention to the dates on which routine surveys become due. The Gas Facility Maintenance Program can be used for scheduling and monitoring all established survey frequencies.
- n. Division Gas, Gas Transmission & Storage, and Region Transmission & Substation must perform periodic upload transactions with Gas Distribution to update gas leak survey and repairs.
- o. Review:
 - (1) As the leak survey is in progress, results shall be reviewed on a daily basis by, or at the discretion of the local supervisor. The supervisor can then ensure that periodic leak surveys are scheduled and completed in the field on time so that the necessary action can be taken.
 - (2) Upon completion of the survey, or as the survey progresses, the program shall be reviewed by the division engineer or equivalent so that long-range plans, replacement studies, or other action can be formulated.
- p. Audits

Audit of records shall be made by Gas & Electrical Technical Services as frequently as deemed necessary but at least annually.

VOLATILE COMBUSTIBLE MATERIAL IN SOIL

- 8.a. If the source of the gas leak can not be found after a thorough field investigation by our leak surveyors or Gas Leak Crews one potential cause that must be considered is the presence of combustible material in the soil. When such conditions exist:
 - (1) The local headquarters must request that the material be further analyzed by an authorized lab or Technical and Ecological Services. TES analyzes gas samples using a gas chromatograph to ascertain the constituents.
 - (2) After the analyses are made, the ultimate decision concerning the source of the unknown gas should include the opinion of Division Gas Engineering or Gas Transmission & Storage Department and the local Hazardous Waste or Environmental Coordinator.
 - (3) If the combustible gas is not ours, the matter should be immediately referred to the public agency, property owner, etc., having the jurisdiction and a record made of the notification.
 - (4) The situation must be monitored to keep informed about the eventual abatement of the hazard and to be cognizant of it when performing future leak surveys.

- b. Local supervisors must ensure that their operating personnel are trained and that such training includes an awareness of sources of combustibles gas other than our own.
- c. It is recommended that the local headquarters contact the appropriate local safety officials and give them copies of the enclosed articles for their information.
- d. Upon detecting foreign combustible material it is our responsibility to identify and report it immediately. The probability of combustible gas indications not being from our pipes is very low. Foreign combustible material is not to be blamed for every leak that is hard to find.