62-7501 REV. 4-65

PACIFIC GAS AND ELECTRIC COMPANY
STANDARD PRACTICE

STANDARD PRACTICE NO. 460.21-4

EXECUTIVE OFFICE OR DIVISION GAS OPERATIONS — PAGE NO. 1 — EFFECTIVE 9/30/77

ISSUING DEPARTMENT GAS DISTRIBUTION — REPLACING PAGE NO. 1 — EFFECTIVE 10-15-74

SUBJECT: PERIODIC LEAKAGE SURVEYS OF GAS TRANSMISSION AND DISTRIBUTION FACILITIES

PURPOSE

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

POLICY

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

RESPONSIBILITY

3. The responsibility for performance of the regular procedure of inspection for gas leaking from the Transmission and Distribution facilities, shall rest with the Division or Pipe Line Operations Supervisor, who directs the maintenance and operation of the facilities.

REFERENCES

4.
**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 Leakage"
S.P. 460.21-3,	"Investigating Gas Leaks on Customer's Premises"
**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"

Gas Standard and Specification M-53, "Portable Combustible Gas Indicator"
C.P.U.C. General Order 112-C

SUPPLEMENT

5. The detailed considerations of the leak survey program appear in the supplement to this Standard Practice.

* Paragraph Revised
** Paragraph Added

(SEE OVER)

62-7501 REV. 4-65

PACIFIC GAS AND ELECTRIC COMPANY
STANDARD PRACTICE

STANDARD PRACTICE NO. 460.21-4

EXECUTIVE OFFICE OR DIVISION GAS OPERATIONS — PAGE NO. 2 EFFECTIVE 9/30/77

ISSUING DEPARTMENT GAS DISTRIBUTION — REPLACING PAGE NO. 2 EFFECTIVE 10-15-74

SUBJECT: PERIODIC LEAKAGE SURVEYS OF GAS TRANSMISSION AND DISTRIBUTION FACILITIES

APPROVED [redacted]

DISTRIBUTION

Manager, Safety, Health and Claims Department
Director, Organization Planning
Gas Operations Managers
Division Managers
Division Gas Superintendents
District Gas Superintendents or Equivalent
District Managers
Division Administrative Analyst or Equivalent

ADDITIONAL COPIES

Additional copies of this Standard Practice may be obatined from Gas Operations, 77 Beale Street, San Francisco (PG&E Ext. 9-1604).

* Paragraph Revised
** Paragraph Added

(SEE OVER)

TABLE OF CONTENTS

**Exhibit A
Letter: J.A. Fairchild to Division Gas Superintendents,
Subject: "Volatile Combustible Material in Soil"

**Paragraph Added

DEFINITIONS

6. The following definitions shall apply to this Standard Practice:

a. Class Locations: Are defined in Section 192.5 of California Public Utilities Commission General Order No. 112-C.

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 and other gas operating installations.

c. Gas Facilities: Company operated gas lines, including gas mains, service lines, pipelines, and their appurtenances.

d. Leak Survey: A search for possible gas leakage in any area where gas facilities exist, or where gas leakage 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 indicators.)

h. Building: Any structure used by humans for business, residential or other purposes, and in which gas could accumulate.

* i. Tunnel: A subsurface passageway large enough for a man to enter and in which gas could accumulate. For purposes of this Standard Practice, "tunnel" also includes sewers, pipelines, aqueducts, etc., which are sufficiently large to permit a man to enter.

j. Confined Space: Any substructure of sufficient size to accommodate a person, and in which gas can accumulate: e.g., vaults, manholes, or other structures where ventilation is limited.

k. Reading: A repeatable indication on a gas detector, Where the reading is in an unventilated confined space, consideration should be given to the rate of dissipation when the space is ventilated, and the rate of accumulation when the space is resealed.

** l. Transmission Main: All lines in transmission capital and distribution mains operating at or over 20% SMYS (described in S.P. 463-8).

* m. Feeder Main: Any main, other than transmission or gathering, that is operating at a pressure of over 60 psig.

** n. Substructure: Any structure, tunnel, passageway, or other confined space below ground level where gas could accumulate.

*Paragraph Revised
**Paragraph Added

*0. 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

7. a. Surveillance and repair priority shall be based on such factors as:

* (1) The volume, gas-air concentration, and type of escaping gas, (See Exhibit A)

* (2) The size and occupancy of the area where leakage occurs, 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 of sources of ignition.

(6) Public awareness, apprehension and reaction to the leak situation.

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

8. a. Grade 1

(1) Initial Report (Leak Surveyor, Company Personnel, Others): Examples:

(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 6.j., k.)

(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 small nongas substructures where the gas would likely migrate to the outside wall of a building.

*Paragraph Revised

(v) Escaping gas that has ignited.

(vi) Gas which can be seen, heard, or felt in a location that may endanger the general public or property.

(vii) Any gas leakage reported by other than Company or Company-contracted personnel.

(viii) Any gas leak which, in the judgment of the surveyor or supervisor, is an immediate hazard.

(2) Response (Leak Crew, Inspector, Serviceman, Supervisor, Other Qualified Employee)

(i) Investigate without delay.

(3) Action

(i) Repair leak, or take 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) Reroute traffic, block railroads.

(ii) Downgrade from No. 1 and set repair priority if immediate repair not required.

b. Grade 2

(1) Initial Report (Leak Surveyor, Company Personnel): Examples:

(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 of less than 80% LEL in a small nongas 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 (Qualified Employee)

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 7.a.

(iii) Downgrade to No. 3 if non-hazardous and can reasonably be expected to remain so.

c. Grade 3

(1) Initial Report (Leak Surveyor, Company Personnel): Examples:

(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.

*Paragraph Revised
**Paragraph Added

(2) Response (Qualified Employee or Leak Surveyor)

(i) 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

9. 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 herein 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 Exhibit A: Letter from J. A. Fairchild to Division Gas Superintendents.) When leak indications are found to originate from a foreign source or facility, such as gasoline vapors, sewer or marsh gas, or customer-owned piping, 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

10. a. Annually - where any one of the following criteria 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)(i) and (ii), General Order No. 112-C, where, in the opinion of the supervisor, conditions warrant annual survey. This may include certain buildings occupied by 20 or more persons, outdoor theaters, recreation areas, etc. In all cases, schools, hospitals and churches must be surveyed annually.

(3) All transmission mains and feeder mains operating at 20% SMYS or over.

(4) Gas facilities transporting unodorized gas in Class 1 or 2 locations.

*Paragraph Revised

*(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

(1) All buried station piping.

**(2) Gas Distribution facilities not cathodically protected.

c. Every five years - 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.

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

(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 the project.

(i) All Grade 2 leak indications are to be cleared prior to start of the project.

(ii) All Grade 3 leak indications are to be verified by barhole 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 Exhibit A).

(2) Tests such as those described in Section 11.d.(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 tests to assure that no further leakage exists and that tunnels and confined spaces are clear of readings.

(4) Testing may be combined with the procedures described in Standard Practice 403-2, "Request for Information Concerning the Location of Company-Owned Facilities."

**Paragraph Added

LEAK SURVEY METHODS

11. Following are the acceptable methods of gas leakage 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).

*(ii) Mobile-type electronic survey method is not suited for propane-air system surveys unless bar holes are drilled before the survey to a depth equal to that of the main or permanent test holes are established at the same depth at approximately 50-foot intervals.

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 testing pavement cracks and substructures.

(2) Test Procedures:

(i) Test at exposed piping, at surface openings, pavement cracks and joints, unpaved areas, or at other locations where gas may vent.

(ii) Test over all services and meter sets.

(iii) Test over mains and other piping not accessible to the mobile unit.

(iv) At one-year locations described in Section 10.a(2), install permanent test station if there are insufficient surface openings.

(v) At one-year locations described in Section 10.a(5), test meter sets within buildings, at pipe entering through basement walls and at other possible sources of gas leakage.

*Paragraph Revised

*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 as the sole method 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 purpose types of surveys that may be initiated for a variety of reasons. Examples are:

(i) Further and more detailed tests 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 pressure conversions.

(v) Testing major construction projects where large trench, chamber or vault excavations are made, or as required by Section 10.e.

(vi) Suspected leakage or questionable conditions.

(vii) All Company gas facilities in the vicinity of a fumigation.

(2) Test Procedures: One or more of the following are to be included in search procedures:

(i) Conduct test 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 testing at points where gas facilities cross building or home sewer laterals.

*Paragraph Revised

(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 10.b., are to be followed.

RECORDS AND REPORTS

12. Following are the records and reports to be made in conjunction with leakage inspection procedures:

a. Route books or folders, made up of reduced plat sheet copies and indicating the established test frequency, shall be prepared and maintained in each District Office or operating headquarters.

b. For the surveys contemplated under Paragraph 10-a-(2) special route books or other suitable system shall be prepared.

c. Blocks of leak numbers are to be assigned by the District to all Company and contractor personnel reporting leakage.

*d. All leak indications are to be recorded on the Leak Survey Log (Form 62-3103), Leak Survey, Inspection and Repair Report (Form 62-3117), or equivalent form 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. Leak numbers are not to 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.

f. Completed route book plat sheet copies are to be turned in to the operating headquarters with the following information:

(1) Dates tested, main and services; test 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 plat sheet block that 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.

g. Leak Survey, Inspection and Repair Report - Form A (62-3117) is to be used to record computer input data, and all information relative to test findings, main condition and repair. Pipeline, main and service inspection records are to be maintained in accordance with Standard Practice 460.2-2.

*Paragraph Revised

h. Leak Survey, Inspection and Repair Report - Form C (62-3013) is to be used for updating existing computer entries. It may also be used to transmit initial entries to the computer, in lieu of the Form A input sheet.

i. Action taken to mitigate reported leakage shall be recorded and filed with the appropriate route record, or placed in files referenced to the route number.

j. Records of leaks discovered and routine leak survey tests 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 previous survey.

k. 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).

l. In each office where route books are kept, test schedules shall be established, to bring to the supervisor's attention the dates on which routine surveys become due.

m. Review:

(1) As the leak survey is in progress, test results shall be reviewed on a daily basis by, or at the direction of, the local supervisor in charge, so that the supervisor is aware of the findings and necessary action can be taken.

(2) Upon completion of the survey, or as the survey progresses, the program shall be reviewed by the district engineer or equivalent so that long-range plans, replacement studies, or other action can be formulated.

n. Audits

Audits of records shall be made by Division Engineers as frequently as deemed necessary but at least annually.

*Paragraph Revised
**Paragraph Added