

Odorization of Natural Gas

Summary This utility standard defines responsibilities and procedures for the proper odorization of natural gas in Pacific Gas and Electric Company's (the Company's) gas transmission and distribution (T&D) system to ensure compliance with applicable federal and state laws and regulations. This document identifies the odorants that the Company approved for use and specifies the maintenance, operation, and recordkeeping procedures for odorizers and odorant monitoring instruments.

Target Audience The target audience for this standard is all gas transmission and distribution (GT&D) maintenance and construction (M&C) employees responsible for odorizing natural gas.

Safety Perform all gas odorization activities and related work safely and in accordance with all applicable safety rules, the [Code of Safe Practices](#), and [Utility Standard Practice \(USP\) 22, "Safety and Health Program."](#)

Requirements

The requirements and procedures of this standard are detailed in the "[Odorization of Natural Gas Requirements](#)" section starting on Page 2.

This standard is the governing document for the following Company work procedures that address additional requirements and procedures for odorization activities:

- [Work Procedure WP4350-01, "Natural Gas Odorant Releases and Spills"](#)
Procedures describing responsibilities and activities to address natural gas odorant releases and/or spills using approved products for mitigation.
- [Work Procedure WP4350-02, "Bulk Odorant Deliveries, Maintenance, and Operating Procedures"](#)
Responsibilities and activities describing the safe and efficient handling and transportation of natural gas odorant.



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Odorization of Natural Gas Requirements

1. General Information

- 1.1 All gas in T&D lines and gathering lines in Class 3 and 4 locations must be odorized so that its odor is readily detectable at concentrations of one-fifth of the lower explosive limit (LEL) by a person with a normal sense of smell.
- 1.2 Proper levels of odorization must be verified by conducting periodic analyses of the odorized gas and by performing odor intensity tests.

2. Odorant Blends

- 2.1 Only use the gas odorant blends indicated in Table 1.

Table 1. Gas Odorant Blends

Odorant	Description	Recommended Application	Initial Recommended Nominal Rate (lb/MMscf)	Material Code
Odorant 1	50% THT and 50% TBM	Systemwide	0.15 to 0.60	500020
Odorant 2	100% THT	Farm tap odorizers and other specific applications	0.15 to 0.60	500019

THT – Tetrahydrothiophene

TBM – Tertiary butyl mercaptan

lb/MMscf – Pounds per million standard cubic feet

- 2.2 Initial odorization rates must be in accordance with Table 1 above. If high or low odorant or odor levels in the downstream distribution system require that injection rates differ significantly from the recommended nominal rates in Table 1, a thorough field test must be conducted to provide the basis for the deviation from the recommended nominal rates.
- 2.3 All odorant purchases must be coordinated through purchasing personnel.
- 2.4 Refer to [WP4350-02, "Bulk Odorant Deliveries, Maintenance, and Operating Procedures."](#) for detailed procedures concerning the planning, purchase, and coordination of any bulk delivery of odorant by a Company-approved supplier.

3. Odorizers

- 3.1 Odorizers must be designed, installed, and maintained so that sufficient amounts of odorant can be introduced into the gas at all operating flows without wide variations in the



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concentration of odorant in the gas stream. Equipment adjustments may be required if odor intensity readings are outside the specified range.

- 3.2 Odorizers must not be taken out of service without the prior approval of the M&C gas transmission (GT) district supervisor or the M&C distribution gas transmission and regulation (T&R) supervisor. For an extended shutdown period (over 24 hours), a clearance from System Gas Control (SGC) must be obtained. The odorant injection valve on the pipeline must also be closed. NOV-1 1 2B) 192.625
- 3.3 At odorizer inspection and maintenance intervals, the following tasks must be performed:
 1. Inspect all odorizers, except farm tap odorizers, at least once each month.
 2. Check odor intensity downstream of each odorizer, except for farm taps, at the first readily accessible tap.
 3. Check, test, and service farm tap odorizers at least annually.
 4. Maintain and calibrate odorizer equipment in accordance with the equipment manufacturer's recommendations.
 5. Check the liquid level in the odorant "run" tank and/or storage tank at least once a month to ensure an adequate supply of odorant is available until the scheduled filling date.
 6. Use the M&C GT Pipeline Maintenance (PLM) management system to record calibration details and maintenance repairs performed on odorizers and related equipment maintained by M&C GT. Calibration, maintenance, and repair records for odorizers and related equipment maintained by divisions must be kept by the local office for the operating life of the equipment. In the event the equipment is removed from service, the local office must retain records for 5 years after the equipment is taken out of service.

4. Odor Intensity Tests

- 4.1 One of the following approved odor concentration test instruments must be used to perform odor intensity tests:
 - Heath Odorator[®]
 - DTEX[®] Odorant Detection System
 - Bacharach Odorometer[®]
- 4.2 Any new test instruments must first be approved by GT&D gas engineering personnel.
- 4.3 Properly trained operators and technicians with a normal sense of smell must perform odor intensity tests (see [Section 9, "Training,"](#) on Page 5).
- 4.4 Odor concentration test instruments must be calibrated annually in accordance with the manufacturer's instructions.
- 4.5 Odor intensity tests must be conducted at the designated distribution and M&C GT sampling points using the testing frequencies listed in [Attachment 1, "Odor Intensity Test Schedule for Gas Transmission and Distribution Systems."](#)
- 4.6 Gas odor must be readily detectable at a concentration of 0.6% gas-in-air or less.



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- 4.7 If gas odor is not readily detectable at 0.6% gas-in-air, the person conducting the test must immediately notify the appropriate supervisor. The supervisor may verify the reading, if appropriate, and must immediately notify the GT district supervisor and/or the M&C distribution gas T&R supervisor, who ensure that immediate and continuing actions are taken to restore adequate odor concentration levels.

5. Sulfur Analyzers

- 5.1 Sulfur analyzers are used to monitor the concentration of odorant and/or sulfur compounds in the major sources of out-of-state gas, such as Canadian and U.S. southwest supplies and in the gas from major underground gas storage fields.
- 5.2 In conjunction with odor intensity tests, data from these sulfur analyzers is used to verify proper levels of odorant concentration in the gas. These analyzers also determine when or if supplemental odorization must be started at strategic locations in the system.

6. Response to High or Low Odorant Concentration

- 6.1 In response to reports of high or low odorant concentration levels, immediate action must be initiated to investigate and take necessary corrective measures.
- 6.2 Upon receipt of a report of low odorant concentration, the district must initiate immediate and continuing actions to restore adequate odorant concentration levels to provide properly odorized gas. SGC and the affected distribution operating employees must be notified of the situation. SGC coordinates communication between the GT gas quality on-call group, M&C districts, and affected distribution locations.
- 6.3 When high odorant levels are found, the district must take corrective action and immediately notify SGC and the affected distribution locations.
- 6.4 If the situation warrants, the California Public Utilities Commission (CPUC) must be notified of any problems associated with low or high odor intensity levels in the gas system. GT&D coordinates any CPUC notification relating to odorization.
- 6.5 After taking action to correct low odorant concentration levels, an odor intensity test must be conducted to ensure adequate odorant levels. SGC and the M&C distribution superintendents must be notified after corrective actions are taken.

7. Odorization Records and Reports

- 7.1 [Form 62-4650, "Monthly Odorization Report," \(Attachment 2\)](#) must be completed monthly for all odorizer stations and used at all odorizer locations, except farm taps.
- 7.2 [Form 62-4650 \(Attachment 2\)](#) requires that an accurate method of determining total odorant usage and total gas treated be used. A copy of the completed report indicating the GT district supervisor's or M&C distribution supervisor's review and approval must be forwarded to the manager in charge of GT&D gas engineering. The originals of these reports must be retained in the local distribution office or GT district file for at least 5 years.

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- 7.3 The odor intensity readings on [Form 62-4650 \(Attachment 2\)](#) can be taken either once at the end of each month (during the final monthly visit) or reported as an average of multiple reads during the reported month. If a sulfur analyzer is located directly downstream with no other source of gas intermingling and the analyzer continually monitors the concentration of odorant, the odorant intensity reading is not required.
- 7.4 Odor intensity test results, for the sample locations shown in [Attachment 1, "Odor Intensity Test Schedule for Gas Transmission and Distribution Systems,"](#) must be recorded using [Form 62-3480, "Odor Intensity Report," \(Attachment 3\)](#). For test sample locations, refer to [Attachment 1](#). The original copy of the completed report indicating the review and approval of the GT district supervisor or M&C distribution gas T&R supervisor must be forwarded to GT&D station engineering personnel. A copy of this report must be retained in the local distribution office or GT district file for at least 5 years.
- 7.5 The "Comments" section of [Form 62-3480 \(Attachment 3\)](#) must be used to indicate any corrective actions taken to restore odorant concentration levels, or any other unusual conditions worth reporting.
- 7.6 Calibration of odorant concentration test instruments and odorant chromatographs must be performed annually and properly documented. Documentation must be maintained on file in the district or division files for as long as individual instruments remain in service.

8. Responsibilities

- 8.1 The responsibility for odorization of natural gas rests with the M&C distribution gas T&R supervisor and the GT district supervisor who direct the maintenance and operation of facilities and equipment relating to odorization (such as odorizers), odor concentration test instruments, and sulfur analyzers.
- 8.2 Gas system integrity personnel are responsible for communicating with the appropriate government agencies, such as the Department of Transportation (DOT) and the CPUC.

9. Training

Training GT and M&C gas district and distribution employees on the maintenance and operation of odorizers and odorant monitoring instruments can be arranged through the GT&D Gas Engineering facility engineer assigned to manage odorant operations.

END of Requirements

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Definitions

CFR: Code of Federal Regulations.

CPUC: California Public Utilities Commission.

DOT: Department of Transportation.

ED: Energy Delivery.

LEL (lower explosive limit): The lowest concentration of natural gas-in-air that supports combustion. For the Company's natural gas, the LEL is approximately 5% gas-in-air.

Odor intensity test instrument (commonly called an "odorometer"): An instrument used to determine the odor intensity at various gas-in-air concentrations.

Odorant: A chemical compound that is added to natural gas to give it a characteristic scent that warns of its presence.

Odorizer: The equipment used to add odorant to natural gas.

TBM: Tertiary butyl mercaptan, a natural gas odorant.

THT: Tetrahydrothiophene, a natural gas odorant.

Implementation Responsibilities

The senior director in charge of asset strategy and planning is responsible for reviewing, approving, and distributing this standard.

The senior director delegates authority to the director in charge of gas engineering to revise and reissue attachments to this standard or to approve variances from the requirements in this standard on an exception basis.

The directors, managers, superintendents, and supervisors in charge of energy delivery are responsible for ensuring that the provisions of this standard are followed.

Governing Document

NA

Compliance Requirement/Regulatory Commitment

Responsible managers and superintendents measure implementation and effectiveness. In addition, internal Company departments and the CPUC may conduct periodic audits to verify compliance with this standard, the requirements of [CPUC G.O. 112-E, "State of California Rules Governing Design, Construction, Testing, Operation, and Maintenance of Gas Gathering, Transmission, and Distribution Piping Systems"](#), and [Code of Federal Regulations \(CFR\), Title 49, Section 192.625, "Odorization of Gas."](#)



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Reference Documents

[CFR, Title 49, Section 192.625, "Odorization of Gas"](#)

[Code of Safe Practices](#)

[CPUC G.O. 112-E, "State of California Rules Governing Design, Construction, Testing, Operation, and Maintenance of Gas Gathering, Transmission, and Distribution Piping Systems"](#)

[Numbered Document N-12, "Typical Pipeline Odorant Injection System Specification"](#)

[USP 22, "Safety and Health Program"](#)

Work Procedures:

- [WP4350-01, "Natural Gas Odorant Releases and Spills"](#)
 - [WP4350-02 "Bulk Odorant Deliveries, Maintenance, and Operating Procedures"](#)
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Appendices

NA

Attachments

[Attachment 1, "Odor Intensity Test Schedule for Gas Transmission and Distribution Systems"](#)

[Attachment 2, Form 62-4650, "Monthly Odorization Report"](#)

[Attachment 3, Form 62-3480, "Odor Intensity Report"](#)

Document Recision

This standard supersedes Utility Standard S4350, "Odorization of Natural Gas," issued February 2008.

Approved By

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Revision Notes

Where?	What Changed?
S4350	<ul style="list-style-type: none">• Imported standard to new template and renumbered the document from S4350 to TD-4350S.• Added the following requirement in Paragraph 3.2 on Page 3: "The odorant injection valve on the pipeline must also be closed."• Added Farm Tap Odorizers for Rio Vista and Meridian Districts to Attachment 1, "Odor Intensity Test Schedule for Gas Transmission and Distribution Systems."

