

LP Gas Odorization and Testing

Storage and Handling of Liquefied petroleum Gases

CFR 29 1910 (b) 1

(b) Basic rules —(1) Odorizing gases. (i) All liquefied petroleum gases shall be effectively odorized by an approved agent of such character as to indicate positively, by distinct odor, the presence of gas down to **concentration in air of not over one-fifth the lower limit of flammability**. Odorization, however, is not required if harmful in the use of further processing of the liquefied petroleum gas, or if odorization will serve no useful purpose as a warning agent in such use or further processing.

(ii) The odorization requirement of paragraph (b)(1)(i) of this section shall be considered to be met by the use of **1.0 pounds of ethyl mercaptan**, 1.0 pounds of thiophane or 1.4 pounds of amyl mercaptan **per 10,000 gallons of LP-Gas**. However, this listing of odorants and quantities shall not exclude the use of other odorants that meet the odorization requirements of paragraph (b)(1)(i) of this section.

CFR 49 Part 173 – Shippers- General Requirements

- section §173.315(b)
- (1) Odorization. All liquefied petroleum gas shall be effectively odorized as required in Note 2 of this paragraph to indicate positively, by a distinctive odor, the presence of gas down to a concentration in air of not over **one-fifth the lower limit** of combustibility provided, however, that odorization is not required if harmful in the use or further processing of the liquefied petroleum gas, or if odorization will serve no useful purpose as a warning agent in such use or further processing.
- Note 1: The lower limits of combustibility of the more commonly used liquefied petroleum gases are: Propane, 2.15 percent; butane, 1.55 percent. These figures represent volumetric percentages of gas-air mixtures in each case.
- Note 2: The use of 1.0 pound of ethyl mercaptan, 1.0 pound of thiophane, or 1.4 pounds of amyl mercaptan per 10,000 gallons of liquefied petroleum gas shall be **considered sufficient** to meet the requirements of §173.315(b)(1). This note does not exclude the use of any other odorant in sufficient quantity to meet the requirements of §173.315(b)(1).

NFPA 58 2004 Edition

4.2 LP-Gas Odorization.

4.2.1* All LP-Gases shall be odorized prior to delivery to a bulk plant by the addition of a warning agent of such character that the gases are detectable, by a distinct odor, to a concentration in air of not over **one-fifth the lower limit** of flammability.

CRF 49 Part 192 Pipeline Safety Regulations

§192.625 Odorization of gas.

(a) A combustible gas in a distribution line must contain a natural odorant or be odorized so that at a concentration in air of **one-fifth of the lower explosive limit**, the gas is readily detectable by a person with a normal sense of smell.

(f) To assure the proper concentration of odorant in accordance with this section, each operator must conduct **periodic** sampling of combustible gases **using an instrument capable of determining the percentage of gas in air at which the odor becomes readily detectable**. Operators of master meter systems may comply with this requirement by-

- (1) Receiving written verification from their gas source that the gas has the proper concentration of odorant; and
- (2) Conducting periodic "sniff" tests at the extremities of the system to confirm that the gas contains odorant.

What regulations will a Stain Tube work for

- CFR 29 1910 (b) 1 OSHA YES
 - the presence of gas down to concentration in air of not over one-fifth the lower limit of flammability.
- CFR 49 Part 173 – Shippers- General Requirements YES
 - the presence of gas down to a concentration in air of not over one-fifth the lower limit
- NFPA 58 2004 Edition YES
 - gases are detectable, by a distinct odor, to a concentration in air of not over one-fifth the lower limit of flammability.
- CFR 49 Part 192.626 (a) YES
 - must contain a natural odorant or be odorized so that at a concentration in air of one-fifth of the lower explosive limit
- CFR 49 Part 192.625 (f) NO
 - instrument capable of determining the percentage of [gas in air at which the odor becomes readily detectable](#)

Incident Massachusetts July 30, 2010

Multiple calls for a reported explosion

Resulted in 7 injuries and 1 fatality.

5 alarm rescue/fire mission; took over an hour to extricate victims.

It was determined that under-odorized gas along with odorant fade were the cause.



NEW HAMPSHIRE CODE OF ADMINISTRATIVE RULES

Chapter 500 Rules for Gas Service

Adopted May 10, 2013

PUC 512.08 Construction and Maintenance.

(g) By July 1, 2014, each LPG operator shall test for odorant levels in accordance with (f) above at least quarterly each calendar year, with intervals not exceeding 3 and a half months at the operator bulk plants that supply LPG to an LPG jurisdictional systems. These tests shall be performed with an odorometer or equivalent device capable of determining the percentage of gas in air at which the odor becomes readily detectable by the tester in accordance with 49 C.F.R. §192.625. Records shall be preserved documenting each delivery from the operator bulk plant to an LPG jurisdictional system for a period of not less than 2 years.

- Odorization Testing at least quarterly each calendar year, with **intervals not exceeding 3 and a half months at the operator bulk plants** that supply LPG to an LPG jurisdictional systems.
- These tests shall be performed with an odorometer or equivalent device capable of determining the **percentage of gas in air at which the odor becomes readily detectable** by the tester in accordance with 49 C.F.R. §192.625.
- Records shall be preserved documenting each delivery from the operator bulk plant to an LPG jurisdictional system for a period of not less than 2 years.
- **Sniff tests** to determine that odorant is present shall be performed at each LPG jurisdictional system at least once annually and **whenever maintenance is performed** on the system.



The ODOROMETER

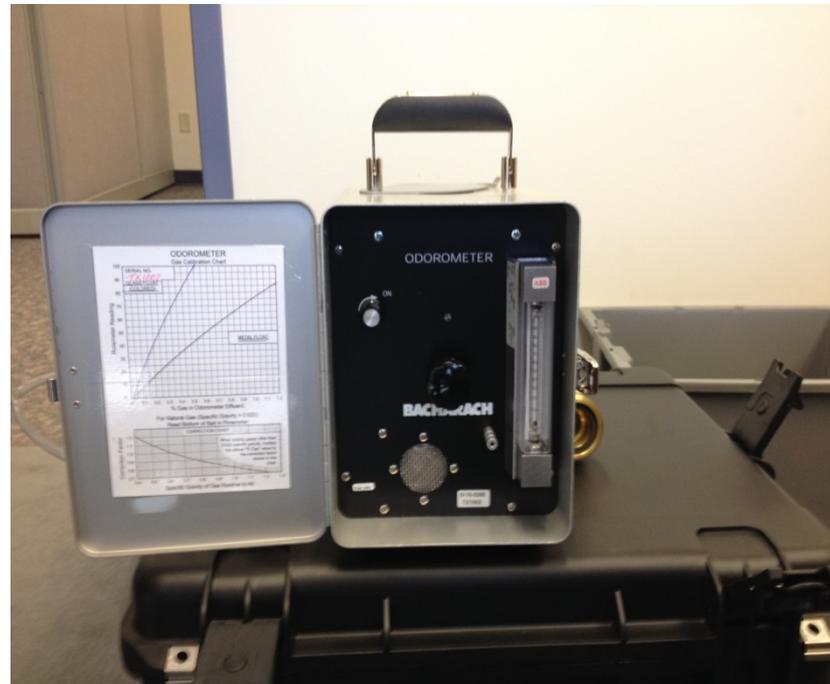
Portable instrument to check the odorization of the gas being distributed.

Provides an easy method of determining the odor intensity of a gas stream

Faster method of determining odor levels at high or low gas-air concentrations than the room-test method.



Testers require pressures below 5 psi



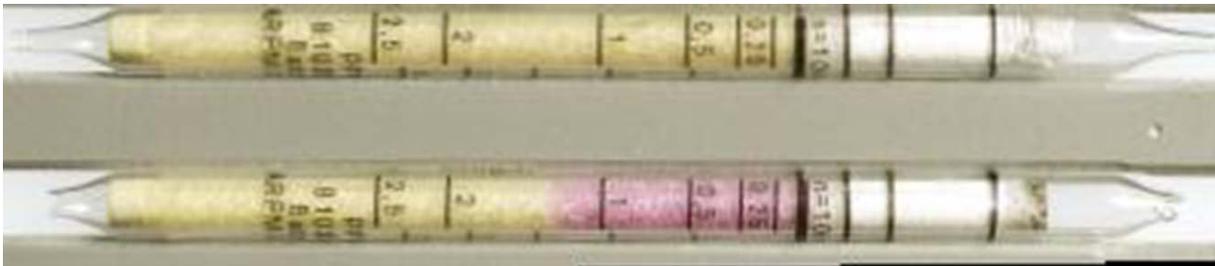


CALIBRATED
BY [unclear]
DATE 10/20/11
CAL. AUTHORITY [unclear]
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- The range of testing on the standard instrument is from one-twentieth of 1% to slightly over 1% gas in air. This range enables the operator to check the accepted gas concentrations for the detection of an odorant in gas.
- The ODOROMETER uses a constant-speed, motor-driven blower to produce a constant flow of air, which is discharged from a glass SNIFFING FUNNEL through an opening in the top of the case, where the operator can sniff it conveniently for the presence of detectable odor.
- Odor meter mixes the gas with air and can determine at which the odor becomes readily detectable in air

Stain Tube tester



Problems Which May Understate Results

- Pump has a leak drawing fresh air with sample
- Improper pump operation, not ensuring that the full stroke occurred
- Failure to accurately count the pump strokes;
- Failure to purge air from the sample collection container
- Plus shelf life of tubes, exposure to sunlight, stored in temperature controlled environment
- Stain Tubes must account for humidity level in which the sample is drawn thus you would have to purchase a water vapor detector tube to be done at the same time
- Stain tube reads in parts per billion in the sample

A stain tube will indicate that odorant is present

but can not determine the percentage at which the odor becomes readily detectable in air

What several operators are doing

Records reviewed of four operators to date

2 large companies, 1 medium, and 1 small

2 are using Bacharach odorometer

2 Heath Odorator

All four companies have done training for the device used and performed at least one test of each facility to be tested

Companies need to update the procedure in their O&M plan and verify the Operator Qualification Plan covers use of a device for testing odorant level in their cover task

Gas Odorization Testing Report

Facility Storage Location: _____ Date: _____

Facility Address: _____

Equipment Manufacturer _____ Serial Number _____

Calibration Date: _____

Odorometer Test Readings

Identify Test Location	Threshold Reading % Gas	Readings (%Gas in Air)	
		Readily Detectable Reading % Gas in Air	Corrected Actual % Gas Value

NOTE: Contact your CSC Manager IMMEDIATELY if the Readily Detectable Limit is Above 0.43% Gas in Air

Testing Inspector Name: _____

Testing Inspector Name
Signature: _____

Propane Bulk Plant Facility Odorant Test Report Form

As required by the NH Public Utility Commission, any Propane Bulk Plant Facility that supplies propane gas to any NH jurisdictional system must be tested and quantified at least quarterly, but not to exceed 3 and one-half months. This test needs to be conducted by trained personnel using an approved odorometer. The test results must be documented on this form and the form maintained in the facility file located in the corporate office.

Name of System: —

System Address Date of Test:

..... Time of Test:

Instrument: Bacharach Odorometer Part Number 5110-0200 Serial Number: TX1002

Employee performing Test (please print):

Employee Signature

Odor level (indicate by signifying with an "X"):

_____ Nil

_____ Barely Detectable

_____ Readily Detectable

_____ Strong

Percent reading at "Readily Detectable":

<u>Float Tube</u>	<u>Effluent</u>	<u>%Gas in Air</u> <i>(Corrected for LP: .628 CF)</i>
70	1.1	0.69
65	0.95	0.60
60	0.85	0.53
55	0.70	0.44
50	0.60	0.38
45	0.50	0.31
40	0.40	0.25

LEL 2.15

.43 = 1/5th LEL

Puc 500 Rules for Gas Utilities

506.02 (m) & (n)

- combustible gases distributed by a pipeline shall have a distinctive odor of sufficient intensity so that at a concentration of **one-fifth of the applicable lower explosive limit**
- Whenever necessary to maintain the level of odorization intensity **odorant shall be added**
- Odorant shall be **non-toxic & non-corrosive**
- facilities for handling the odorant shall be located where the escape of odorant would not be a nuisance
- At **least 12 times per calendar year**, at intervals not exceeding 45 days, each utility shall sample gas distributed at places downstream of all injection points to assure the presence of odorant
- Each utility shall have the **capability of promptly injecting** odorant if the odorant levels are detected

TABLE 508-1

Utility Lower Explosive Limits & Equivalent Percent Gas/Air Ratios

%	Natural Gas % gas/air	Propane % gas/air
LEL		
10	0.5%	0.2%
20	1.0%	0.4%
30	1.5%	0.6%
40	2%	0.8%
60	3%	1.2%
80	4%	1.6%
100	5%	2%