

Odorization Issues



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Contact Information

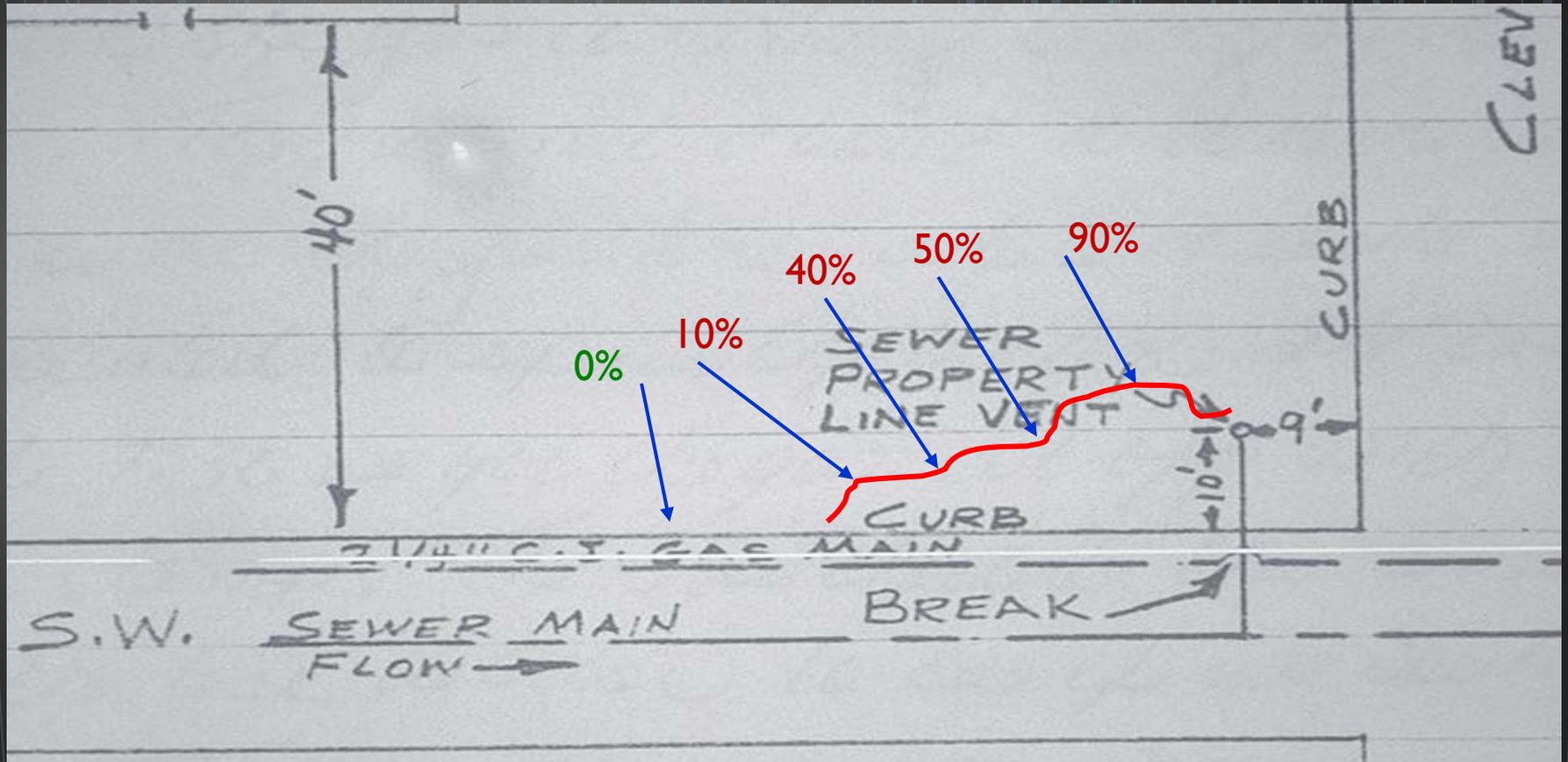
§192.605(b)(11)
§192.615(a)(3)

Gas Reports

Respond promptly
to a report of *gas
odor* in or near a
building...



Plot Gas Migration



Odorant Concentration Verification



Why Odorize?

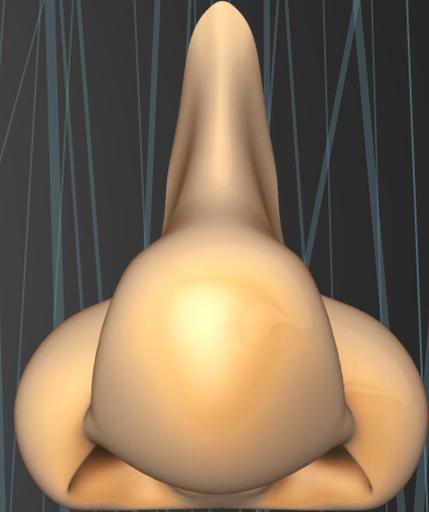
- Regulations – 49 CFR 192.625(a)
 - A combustible gas in a distribution line must contain a natural odorant or be odorized so that at a concentration in air of one-fifth of the lower explosive limit, the gas is *readily detectable* by a person with a *normal sense of smell*.

Why Odorize?

- Liability
 - Odorization of a gas system is done with a single purpose in mind: Provide the public with an effective warning device to alert them when there is a possible problem.

Complying with 49 CFR 192.625

- Readily detectable
- 1/5 LEL
- Class location
- Odorant selection
- Odorizers and injection rates
- Periodic sampling



What is Readily Detectable?

- **Ready** - "in a ready manner: as **a** : without hesitating : **WILLINGLY** **b** : without much difficulty..."
- **Detectable** - "**1** : to discover the true character of **2** : to discover or determine the existence, presence, or fact of..."
- **Readily detectable odor** – *an odor that can be discovered, determined or whose existence can be identified in a ready manner, without hesitating or much difficulty.*

What is Readily Detectable?

- The odor of gas should be one that a spouse, family, or member of the general public would quickly recognize, prompting them to take appropriate action.



Normal Sense of Smell?

- Use a wide variety of testing personnel
- Testing or “qualifying” a sense of smell
- Sensonics “Smell Identification Test”
 - <http://www.sensonics.com>

Gas Company Smell Test

Availability: **In Stock**

SKU: GST

A simple and very cost-effective way to meet government standards, and ensure that your workforce can smell the odor of natural gas.

Price: **\$1.90**



Smell Identification Test

Availability: **In Stock**

SKU: SIT 001

The Smell Identification Test [UPSIT] is our comprehensive 40-item test and is the only olfactory test on the market today that can be self-administered. It is the most reliable (test-retest $r=0.94$) and accurate olfactory test available.

Provides an absolute indication of smell loss (anosmia; mild, moderate, or severe microsomia) as well as an index to detect malingering. Norms from nearly 4,000 men and women spanning the entire age range provide a basis for examinee percentile rank. Available in American, Arabic, British, Chinese (Simplified), Chinese (Traditional), Dutch, French, German, Italian, Japanese, Portuguese, and Spanish.



[More Views](#)



1/5 of the LEL

- Is $1/5 = 1\%$ gas-in-air?
- State regulations
- Define it in the O&M Manual

<u>Gas</u>	<u>L.E.L.</u> <u>% gas in air</u>	<u>1/5 L.E.L</u> <u>% gas in air</u>
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Methane	5.3%	1.06%
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Propane	2.2%	.44%
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Pipeline Gas	5.0%	1.0%
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Pipeline Gas	4.5%	.9%
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Pipeline Gas	4.0%	.8%
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Common
L..E..L..'s

Factors Which Affect Odor Intensity or Perception

- Anosmia - odor blindness
- Smoking
- Colds and Allergies
- Physical condition – age, gender, exposure
- Psychological effects



Which pipelines must always be odorized?

- Distribution lines—

OPS Interpretation, Sept. 10, 1980

Section 192.625(a) requires that gas in distribution lines have a natural odor or be odorized to the limit prescribed.

- *Since service lines are distribution lines, they are subject to the odorization requirements.*
- *The exception from odorization provided by §192.625(b) for some transmission lines does not affect the requirement to odorize gas in distribution lines connected to an un-odorized transmission line.*

Question

Odorant Injection Rates



- Equivalent weights at 1 lb/mmcf
 - 1 pint is approximately 1 pound of odorant
 - .25 grains of sulfur
 - 4 ppm of odorant in the gas stream

What is the minimum allowable odorant injection rate for regulatory compliance?

- There is no injection rate specified in the code. The only requirement for injection rates is in 192.625(e)

Equipment for odorization must introduce the odorant without ***wide variations*** in the level of odorant.

Question

So what is “wide variation”

- **OPS interpretation October 31, 1973**
 - *An acceptable range for variation of odorant concentration would be within a range no lower than a concentration which is readily detectable at one-fifth of the lower explosive limit by the typical person ...*
 - *The intent of the regulations is that the operator would not make variations in odorant concentration that could cause unwarranted public reaction. For the most part, each gas operator has determined the range of odorant concentration needed in its system for compliance with regulatory standards.*

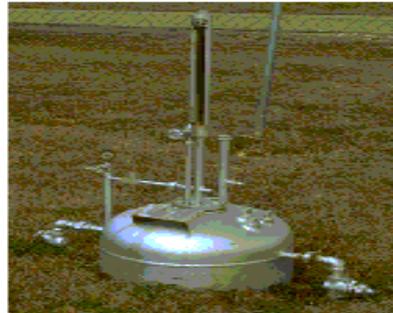
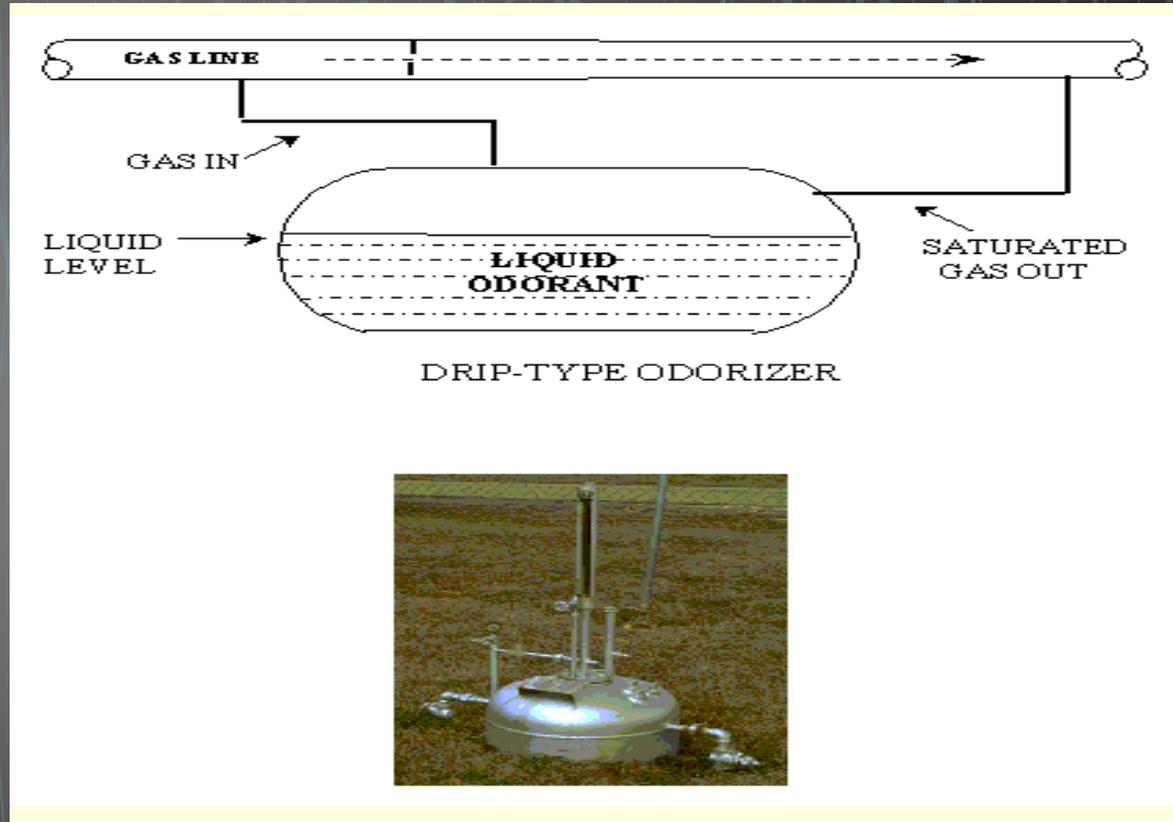
Odorant Components

- EM Ethyl Mercaptan
- DMS Dimethyl Sulfide
- IPM Isopropyl Mercaptan
- TBM Tertiary Butyl Mercaptan
- NPM Normal Propyl Mercaptan
- MES Methyl Ethyl Sulfide
- SBM Secondary Butyl
- THT Thiophane

Types of Odorizers

- Wick
- Wick By-pass
- Drip
- Meter driven pump
- Bourdon Tube
- Injection

Bypass Odorizer



The Odorant

- **The odorant may not be deleterious to people, materials or pipe.**
- **Combustion products may not be toxic to breathe or corrosive to materials exposed to combustion products.**

192.625(c)(1)(2)

Factors Which Affect Odorant Quantity

- Odorizer malfunction
- Contaminants in the odorizer
- Distillate or other liquids
- Pipe wall adsorption
- Oxidation

Regulations And Compliance

- Required levels of odor for compliance.
 - What limits have companies prescribed in their O&M Manuals?
 - Even though the regulations state 1/5 LEL, if an operator has set more stringent levels the testing personnel must follow the O&M and react accordingly.
- The same holds true for injection rates described in the O&M Manual.

Guidance

1. The one-fifth LEL is based on the operators' gas composition.

2. Sniff tests are qualitative tests that should be performed by individuals with a normal sense of smell. Considerations such as gender, age, smoking habits, colds, and other health-related conditions such as allergies or colds that could affect the sense of smell should be considered in selecting individuals to perform sniff tests.

Guidance

3. Records should reflect the person actually doing the sniff test.

- Some operators conduct sniff tests with two individuals, to get more conclusive results.

5. Test locations to verify odorant levels should include system end points (extremities).

Guidance

6. Operators must have written procedures for the testing of odorization.

7. Operator needs to specify the frequency of odorization tests.

8. The operator should retain records of the odor level and odorant concentration test results.

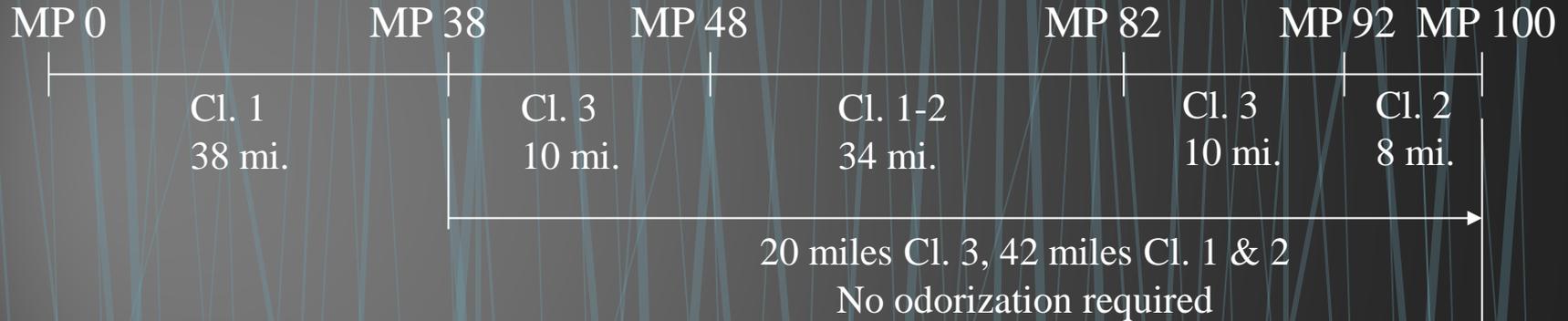
Guidance

9. Odorizer injection rates are not stand alone proof of adequate odorization.

10. Special attention to odorization requirements should be applied to transmission (and transmission laterals) lines where class 3 areas exist.

11. Class location studies are needed to substantiate un-odorized pipelines.

Odorizing Transmission Lines



192.625(b) Gas in Cl. 3 & 4 must be odorized except if 50% downstream is Cl. 1 or 2.

10 miles Cl. 3, 8 miles Cl. 2
Odorization required

Odorizing Transmission Lines

- Other exemptions
 - Lines transporting un-odorized gas to certain facilities before May 5, 1975
 - Lateral lines to distribution centers with 50% of the line in Class 1 or 2 locations
 - Hydrogen used for feedstock in manufacturing

192.625(f) Periodic Sampling

- ...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.



192.625(f) Periodic Sampling

- 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.
- Amdt. 192-93, 68 FR 53895, Sept. 15, 2003

Periodic Sampling

- OPS Interpretation December 17, 1970
 - **Question:** *Section 192.625 - Odorization of Gas. (f) What is OPS meaning of "periodic sampling"?*

Periodic Sampling

- *Answer: In Section 192.625(f), the term "periodic sampling" is used instead of requiring a specific amount of time between tests, **because each system will have different requirements.***
- *For example, where gas flow is low, the odorant may intend to drop out of the gas stream and especially on a new system, the odorant may tend to be absorbed, on the inside surface until the pipe wall becomes saturated. Because of these conditions, odorant sampling should be done more often in such situations than in systems operating under normal conditions. **The operator must sample as often as experience indicated the need, to assure proper odorant level.***

Test Points

- End of system, farthest point in pipe miles from odorizer.
- Areas of low or changing flow rates.
- Known problem areas.
- Downstream of areas where liquids collect.
- New construction, steel or plastic.
- Random test locations.

Operator Qualification

- Qualification required by October 28, 2002
 - Perform assigned covered tasks; and
 - Recognize and react to abnormal operating conditions.
- Odorization must meet 49 CFR 192.625
- Odorization includes two different functions
 - Operation and maintenance of odorizers
 - Testing to verify odor levels

Benefits of Qualification

- Qualification of personnel needed for compliance
- Helps ensure public safety.
- Training, testing and review are critical in developing and maintaining a qualified work force.

OQ2 Protocols

- "Evaluation methods of operator employees and contractors include the evaluation of an individual's knowledge, skills, and abilities to ensure that the individual can perform the assigned covered tasks."

Required Knowledge, Skills and Abilities

- Knowledge of regulations and compliance parameters.
- Understanding operation and maintenance of odorization equipment.
- Ability to conduct odor concentration tests.
- Recognizing abnormal conditions.
- Documentation.

Ensure Qualification

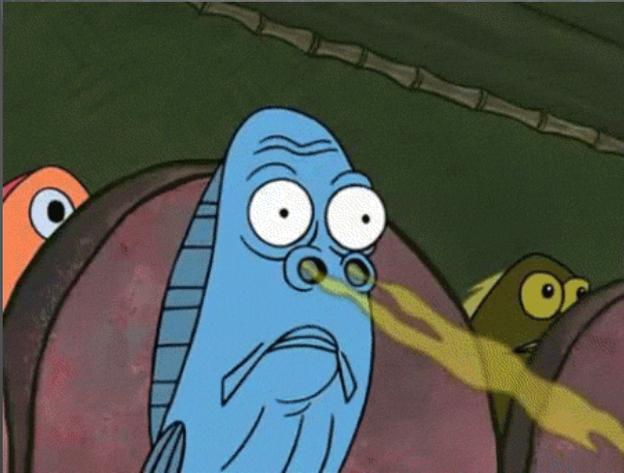
- Written test
- Observation of odor tests
- Document review
- Verification of sense of smell

The Liability of Odorization

- Unintended releases can be dangerous.
- Regulations require
 - Specific detection levels.
 - Odorant quality
 - Periodic testing
- Operators have a duty to exercise *a high degree of care.*



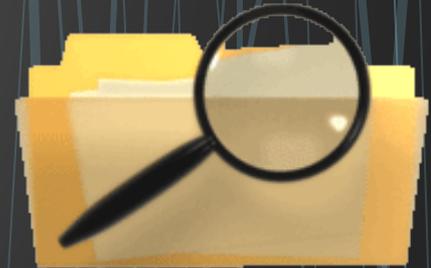
Odorization Risk Management



- Odorization is a means to provide the public with an effective warning device to alert them when there is a possible problem.
- Can the operator prove the odorization of their system is continuous, consistent and operating as designed?

Manage Risk and Liability with an Odorization Audit

- Records and Documentation
- Odorizing equipment
- Personnel qualifications
- Test points and equipment
- Overall leak call rate



Why Audit Odorization?



- Insure that odorization is continuous
- Verify that odorization is consistent
- Make sure the odor works

Records and Documentation

- Injection rates
- Amounts and types of odorant purchased
- Odorizer inspection reports
- Test results from odor concentration meter tests

Records and Documentation

- Training records
- Types of odor calls received
- Results of odor call investigations
- Total number of odor calls received



Document Review Can Find -

- Incorrect reporting of odor intensity.
- Lack of variation in reported odor levels.
- Erratic readings at same location.
- Consistent change in odor levels
 - Change in sense of smell
- Lack of required information.
- Failure to follow company standards.

Odorizing Equipment

- Types of odorizers
- Type of odorant used
- Maintenance activity
- Locations



Personnel Qualifications

- Training on test instruments
- Sense of smell
- Variations in sensitivity
- Training for the masses



Test Points and Equipment

- Location of test points
- Testing frequency
- Odor concentration meters
- Chromatographs

Leak Calls

- Frequency of calls
- Types of leaks/sources found
- Recurring locations.



Evaluation

- Is the odor continuous?
- Is the odor consistent?
- Is the program working as designed?

Conclusion

- You are able to show you are experts
- Program meets its goals
- You are serious about Public Safety

Questions?

