



American Gas Association

Odorization Manual

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Prepared by
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and
Former Chemical and Analytical Services Task Committee

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FOREWORD

This manual is a complete revision of the first "Odorization Manual" published by the American Gas Association in 1983. It is intended to provide a ready reference for the natural gas industry on the topic of natural gas odorization.

One of the reasons natural gas has had such widespread and safe use as an energy source is the addition of odor warning agents to the gas before it is distributed to consumers. While it should be recognized that no odorant will be effective in all situations, these odorants alert most users of the release of flammable gas before unsafe accumulations can occur.

Early manufactured fuel gases, like some sour gas sources, had their own distinct inherent odors. When these gases were replaced by sweet natural gas, the addition of warning-agent additives was recommended and later mandated for safety. In 1942, low-molecular-weight, branched-chain mercaptans were introduced for gas odorization. These compounds are still in use.

Legislated standards for gas odorization have ensured the widespread practice of odorization. Improvements have been made in the chemical composition of odorants, the methods of introducing odorants into natural gas and the methods of measurement to achieve proper odorization. For example, while simple olfactory methods are used to determine odor intensity, the measurement of odorant concentrations now includes the use of sophisticated chromatographic analytical techniques.

As with all technological processes, the science and practice of odorization continues to evolve and improve. The information presented here is not intended to cover all the details and aspects of odorization. It should provide the reader with an understanding of basic concepts of odorization and an overview of regulatory obligations, as well as guidelines that can help the reader to design odorization systems and to develop practices and procedures to effectively odorize natural gas. Revisions to this manual may become necessary from time to time. Whenever any revisions are deemed advisable, recommendations should be forwarded to the American Gas Association. A form is included for that purpose at the end of this manual.

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CHAPTER 1

ODORIZATION REGULATIONS

1.1 FEDERAL STANDARDS

The Natural Gas Pipeline Safety Act of 1968 delegated to the Secretary of Transportation the responsibility for the regulation and monitoring of the pipeline transport of gas. This authority was assigned within the Department of Transportation (DOT) to the Office of Pipeline Safety in November 1968. A composite of federal standards was issued by this federal agency in 1970.

49 CFR Part 192.625 (Subpart L) of these regulations is titled "Odorization of Gas." This specific regulation was modified in September 1997 and is the regulation in effect at the time of this publication. Because of major differences between the odorization requirements for distribution and transmission systems, the federal standard will be discussed separately below.

1.2 STATE REGULATIONS

The purpose of the federal regulations regarding pipeline safety is to establish a unified code regarding interstate pipeline systems. Therefore, the individual state regulations conform to the requirements of Part 192.625 regarding interstate transmission lines. However, some states impose regulations that are in addition to the federal requirements.

Operators should consult their respective state regulatory agencies to determine if different compliance measures are necessary.

1.3 DISTRIBUTION SYSTEMS

The five separate requirements in 49 CFR Part 192.625 for odorization in distribution piping systems are listed below:

1. 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. (The lower explosive limit is approximately 5 percent natural gas in air.)
2. In the concentration in which it is used, the odorant in combustible gas must comply with the following:

- a. The odorant may not be harmful to people, materials or pipe.
 - b. The products of combustion from the odorant shall not be toxic when breathed or corrosive or harmful to those materials to which the products of combustion will be exposed.
3. The odorant may not be soluble in water to an extent greater than 2.5 parts to 100 parts by weight.
 4. Equipment for odorization must introduce the odorant without wide variations in the level of odorant.
 5. Each operator shall conduct periodic sampling of combustible gases to ensure the proper concentration of odorant in accordance with this section.

1.4 TRANSMISSION SYSTEMS

The odorization requirements for gas transmission systems are determined by the location of the pipeline with respect to several criteria that depend on the classification of the location of the pipeline. If a pipeline fails to qualify for exemption under 49 CFR Part 192.625, the gas flowing through it must be odorized and the odorant must meet all the requirements as specified under distribution systems.

1.4.1 Classification Determination

Class locations are defined in 49 CFR Part 192.5 (Subpart A):

The class location onshore is determined by applying the criteria set forth in Part 192.5. The class location unit is an area that extends 220 yards (200 meters) on either side of the centerline of any continuous one-mile length (1,600 meters) of pipeline. For the purposes of determining class, each separate dwelling unit in a multiple dwelling building is counted as a separate building intended for human occupancy.

There are four classes and these are defined as follows:

- Class 1.** Offshore is Class 1. Also, Class 1 is any class location unit that has 10 or fewer buildings intended for human occupancy.
- Class 2.** A Class 2 location is any class location unit that has more than 10 but less than 46 buildings intended for human occupancy.