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CGA P-74—2019

**STANDARD FOR TUBE TRAILER
SUPPLY SYSTEMS AT
CUSTOMER SITES**

FIRST EDITION



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Work Item 13-051
Bulk Distribution Equipment and Standards Committee

FIRST EDITION: 2019

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1 Introduction

This standard contains minimum requirements for high pressure tube trailers that store compressed gases and serve as supply systems at customer locations. It details requirements for locating/siting, selecting equipment, installing, starting up, maintaining, and removing tube trailer supply systems.

2 Scope

This standard applies to compressed gas storage systems at customer locations that use tube trailers as the storage vessel. The tube trailers are delivered to and staged at the customer location. This standard does not apply to tube trailers that are used only to deliver compressed gases to permanently-installed gas storage systems such as receivers, where the tube trailers are not staged on site and do not serve as the storage vessel. It does not apply to mobile acetylene trailer systems, which are covered in [CGA G-1.6, Standard for Mobile Acetylene Trailer Systems](#) [1].¹

Tube trailers provide a means to transport and supply nonliquefied (gaseous) compressed gas products at ambient temperatures. In this publication, the term tube trailer refers to a trailer meeting the requirements of U.S. Department of Transportation (DOT) and Transport Canada (TC) for design, testing, and maintenance [2, 3].

Standard pressures for tube trailers range from 2000 psi to 3500 psi (13 789 kPa to 24 131 kPa), with some trailers supplying higher pressures up to 10 000 psi (68 947 kPa).² A common pressure in use today is 2400 psi (16 547 kPa).

Tube trailers may be used as a direct supply method of various gases to a customer installation. Two primary methods of delivery are typically used with tube trailer supply systems: single trailer installations (with or without permanent ground high pressure back up or storage), and multi-trailer installations. For a single trailer installation, there can be an interruption of service during the change out of the trailers. For a multi-trailer installation, there may be the capacity to have more than one trailer providing gas so during a change out of the trailers there is no need for an interruption of supply.

Tube trailers providing the following gases are within the scope of this publication:

- flammable gases;
- inert gases; and
- oxidizing gases.

Toxic gases (Division 2.3) are not covered in this publication.

The designer shall use the general requirements for all tube trailer supply systems along with the specific requirements for the type of gas stored in a particular tube trailer. For example, tube trailer supply systems for flammable gases such as hydrogen will have more requirements for mitigating ignition hazards than will tube trailer supply systems for inert gases such as helium.

DOT and TC authorized tubes (with or without wheels) shall be designed, maintained, and tested in accordance with the applicable transport regulation(s) [2, 3].

This standard does not apply to medical use or applications. For medical use, refer to [CGA M-1, Standard for Medical Gas Supply Systems at Health Care Facilities \(an American National Standard\)](#) [5].

¹ References are shown by bracketed numbers and are listed in order of appearance in the reference section.

² kPa shall indicate gauge pressure unless otherwise noted as (kPa, abs) for absolute pressure or (kPa, differential) for differential pressure. All kPa values are rounded off per [CGA P-11, Metric Practice Guide for the Compressed Gas Industry](#) [4].

3 Definitions

For the purpose of this publication, the following definitions apply.

3.1 Publication terminology

3.1.1 Shall

Indicates that the procedure is mandatory. It is used wherever the criterion for conformance to specific recommendations allows no deviation.

3.1.2 Should

Indicates that a procedure is recommended.

3.1.3 May

Indicates that the procedure is optional.

3.1.4 Will

Is used only to indicate the future, not a degree of requirement.

3.1.5 Can

Indicates a possibility or ability.

3.2 Technical definitions

3.2.1 Authority having jurisdiction (AHJ)

Organization, office, or individual responsible for enforcing the requirements of a code or standard, or responsible for approving equipment, materials, an installation, or a procedure.

3.2.2 Emergency isolation

Method of shutting off the flow of gas in an emergency situation.

3.2.3 Ground mounted storage/tubes

Permanently or temporarily installed high pressure gas receivers.

3.2.4 Model codes

Building, fire, or other safety code developed and maintained by a national standards development organization intended to be adopted by local jurisdictions with or without modifications.

3.2.5 Nonliquefied compressed gas

Gas other than a gas in solution and under the charged pressure that is entirely gaseous at 68 °F (20 °C).

NOTE—Examples of nonliquefied compressed gases include: oxygen, nitrogen, argon, helium, hydrogen, and carbon monoxide.

3.2.6 Permanent installations

System employing a stationary (fixed) or portable container used exclusively for storage or supply for an indefinite period of time greater than nine months.

3.2.7 Pressure control manifold

Used to reduce high tube trailer pressure to meet the customer pressure and flow requirement.

3.2.8 Remote monitoring equipment

System designed to track gas storage pressure to enable automated notifications of the remaining product.

3.2.9 Safety data sheet (SDS)

Written or printed information concerning a hazardous material (properties, precautions, etc.) following national regulations.

NOTE—SDSs were previously known as material safety data sheets (MSDS).

3.2.10 Source valve

Shutoff valve placed between the bulk supply system and the user's distribution piping.

NOTE—It permits the bulk supply system to be isolated from the user's facility.

3.2.11 Temporary installations

Tube trailer supply system used within a time period not to exceed 9 months.

3.2.12 Tube trailer

Trailer or semitrailer motor vehicle designed specifically for the transportation of horizontally mounted tube bundles.

3.2.13 Unloading station

Assembly of valves and other components that enables product transfer from a tube trailer.

3.2.14 Vent stack

Engineered pipe structure designed to release gases at a height above grade based upon the flow rate and product properties.

4 Health hazards and safety considerations

For detailed information about the properties of typical products that can be stored in tube trailer supply systems, see the following publications or the product safety data sheets (SDS):

- [CGA G-4, Oxygen](#) [6];
- [CGA G-5, Hydrogen](#) [7]; and
- [CGA P-9, The Inert Gases: Argon, Nitrogen, and Helium](#) [8].

All work on these systems shall be performed by trained personnel. See Section 5 for additional details on personnel training requirements.

Area electrical classification shall be defined per National Fire Protection Association (NFPA) 55, *Compressed Gases and Cryogenic Fluids Code* [9]. Cell phones, flash photography, and other nonclassified electronic equipment shall not be permitted in the classified area of the flammable gas tube trailer supply system.

Proper personal protective equipment (PPE) is required before working on tube trailer supply system. The PPE required will depend on the product and site hazards and may include gloves, safety glasses, steel or composite toe capped shoes, and fire-resistant clothing.

The tube trailer supply system (i.e., fill hose, station, piping, pressure regulation manifolds, etc.) shall be properly designed, installed, purged, leak-checked, anchored, grounded, labeled, etc. prior to start-up. A pre-startup safety review should be considered before commissioning the system.

Tube trailer supply systems contain compressed gases at high pressures. Exposure to the release of high pressure or rupture of a component not rated for the working pressure can be extremely hazardous and potentially fatal.

The location and arrangement of the tube trailer supply system should minimize potential impact hazards for the driver as he approaches and parks the trailer for service.

5 Personnel training requirements

Personnel working with or installing tube trailer supply systems at customer sites shall have training and/or documented practical experience, and shall be qualified to work with high pressure systems.

Training shall include knowledge of:

- high pressure tube trailer designs and dimensions (including length, width, and height);

- minimum set back requirements for compressed gases (especially flammable gases and systems based on storage volume);
- off-loading piping stations or other control systems used to off-load the tube trailer;
- pressure reducing stations or other control systems installed to provide proper flow and pressure for the application;
- proper installation of a tube trailer supply system including but not limited to piping, valves, hoses, supports, control systems, etc.;
- requirements for tube trailer supply systems to include:
 - foundation requirements
 - grounding requirements, where applicable
 - fencing and gate egress requirements
 - size requirements; and
- tube trailer manifold design, connection(s), valving, and other components.

6 Site selection and preparation

6.1 Model and local code compliance

The location of a tube trailer supply system shall meet local codes for storage of hazardous materials. Local municipalities typically adopt one of the following model fire codes and standards:

- International Code Council (ICC) *International Fire Code*® (IFC®) [10];
- NFPA 1, *Fire Code* [11]; and
- NFPA 55 [9].

NFPA 55, which states “This code shall apply to the installation, storage, use, and handling of compressed gases and cryogenic fluids in portable and stationary cylinders, containers, equipment, and tanks in all occupancies” applies to tube trailer supply systems [9].³ NFPA 1 extracts (copies and pastes) requirements for compressed gas supply systems from NFPA 55 and thus is a secondary reference document. The primary document for supply system requirements is NFPA 55 [11, 9].

The first activity in selecting a suitable site is to determine how to meet the required separation distances from on- and off-site exposures. Before taking measurements and selecting a site, the supplier shall determine if the local codes have requirements that are more stringent than, different from, or supplemental to the model codes. In the absence of a local code, the supplier shall locate the tube trailer supply system to comply with those found in NFPA 55 as follows:

- Hydrogen, methane, carbon monoxide, and any other flammable gas tube trailers shall be sited in accordance with NFPA 55, chapter 10, “Bulk Hydrogen Compressed Gas Systems”;
NOTE—NFPA 55, chapter 7 “Compressed Gases” points to chapter 10 for locating bulk flammable gas systems that are not hydrogen.
- Oxygen tube trailers shall be sited in accordance with NFPA 55, chapter 9, “Bulk Oxygen Systems”; and
- Nitrogen, argon, and helium (inert gases) tube trailers shall be sited in accordance with NFPA 55, chapter 7, “Compressed Gases,” to meet the separation distances to incompatible materials. Generally, the incompatible materials are toxic, highly toxic, pyrophoric, flammable, oxidizing, corrosive, or unstable and shall be at least 20 ft from the inert gas tube trailer [9].

NFPA 55 lists the minimum setback distances to exposures such as property lines, buildings, etc., and lists which distances are permitted to be reduced by the use of firewalls [9]. The IFC and NFPA 1 refer to NFPA 55 for the

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setback distances [10, 11, 9]. The site for a new tube trailer supply system shall meet the setback distances listed in the current version of NFPA 55 [9].

The setback distance tables in NFPA 55 are designed to cover a range of hazards; however, it is possible that a particular user site can have an exposure not specifically defined in NFPA 55 [9]. In such a case, the tube trailer supplier and the customer shall determine a reasonable distance and verify with the authority having jurisdiction (AHJ).

6.2 Electrical considerations

A key consideration for locating a hydrogen, methane, carbon monoxide, or other flammable gas system is the effect on electrical equipment, both with existing components and any hardware to be installed with the compressed gas system. The fire codes and standards listed in 6.1 specify what areas shall be electrically classified as hazardous areas in accordance with NFPA 70, *National Electrical Code*®, and Canadian Standards Association (CSA) C22.1, *Canadian Electrical Code*, and meet the requirements of the following articles in NFPA 70:

- 500 (Hazardous (Classified) Locations, Classes I, II, and III, Divisions 1 and 2);
- 501 (Class I Locations); or
- 505 (Class I, Zone 0, 1, and 2 Locations) [12, 13].

The site design and location of flammable gas equipment shall ensure that all existing ordinary electrical equipment or new equipment, such as lighting, control panels, etc., meet the minimum setback distances in NFPA 55 [9]. It is mandatory to follow these distances. If the site layout requires that new or existing electrical components be located within the electrical classified area, then the equipment shall be made suitable per the requirements of this standard.

Per NFPA 70, hydrogen is designated a Class I, Group B material, carbon monoxide is designated a Class I, Group C material, and methane is designated a Class I, Group D material [12].

The extent of the classified area for electrical equipment depends on the particular operation. The Division 1 and Division 2 locations are defined in NFPA 55 [9].

Oxygen and inert gas tube trailer supply systems do not typically require compliance with article 500 of NFPA 70 unless sited at a customer site where the classified area locations come from other hazardous materials [12].

6.3 Supplier and customer responsibilities

The supplier and customer shall determine a site that meets all model and local code requirements and is agreeable to each party.

The supplier shall install and maintain the tube trailer supply system.

6.4 Equipment layout

The site shall be designed to provide room for the tube trailer supply system. At a minimum, the site shall have room for one tube trailer that is replaced when empty. A preferred approach is to have room for two tube trailers so that a replacement trailer can be connected to the customer pipeline before disconnecting the tube trailer already on line. Such an arrangement allows for continuity of supply. Having room for only a single tube trailer can require an interruption in product supply while switching the trailers. The customer demand patterns could necessitate the use of more than two tube trailers and shall be determined by the supplier and customer.

NOTE—When designing a tube trailer installation, a drive through swap is the most desirable method since it does not involve backing a trailer into position. The drive through design reduces the possibility of backing accidents. However, the backing of tube trailers into position is most common due to design limits imposed by site layout and available egress on the customer site.

Examples of layouts for two-trailer and three-trailer systems are shown in Figures 1 and 2.

NOTE—Trailer lengths can vary. An equipment analysis should be completed before any civil work begins.