

CGA C-23—2018

**STANDARD FOR INSPECTION
OF DOT/TC 3 SERIES AND
ISO 11120 TUBE NECK
MOUNTING SURFACES**

SECOND EDITION

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Work Item 15-004
Cylinder Specifications Committee

NOTE—Technical changes from the previous edition are underlined.

NOTE—Appendix A (Informative) is for information only.

NOTE—Appendix B (Normative) is a requirement.

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1 Introduction

The design details of tube trailers, tube modules, and tube bundles (equipment) vary depending on the specific manufacturer of the unit. In the United States and Canada, tube bundles used to transport high pressure gases usually have a steel bulkhead at each end of the tube bundle. This bulkhead provides structural support for the tubes. The connection between the bulkhead and the tubes is typically affected by the use of a mounting flange that threads on to the neck of the tube and is subsequently bolted to the bulkhead of the trailer (see Figure 1).

For additional information on design considerations for tube trailers, see [CGA TB-25, Design Considerations for Tube Trailers](#) [1].¹

Regardless of the specific mounting configuration, the effects of environmental corrosion on the threaded interface coupled with the dynamic loading and vibration caused by over-the-road transportation can result in the gradual degradation of the mounting threads on the tube. If left unchecked, this gradual degradation can lead to excessive wear on the mounting threads that can drastically reduce the structural strength of the threaded connection creating a potentially unsafe condition. This is especially true in designs where these mounting threads are the primary means of restraint for the tube.

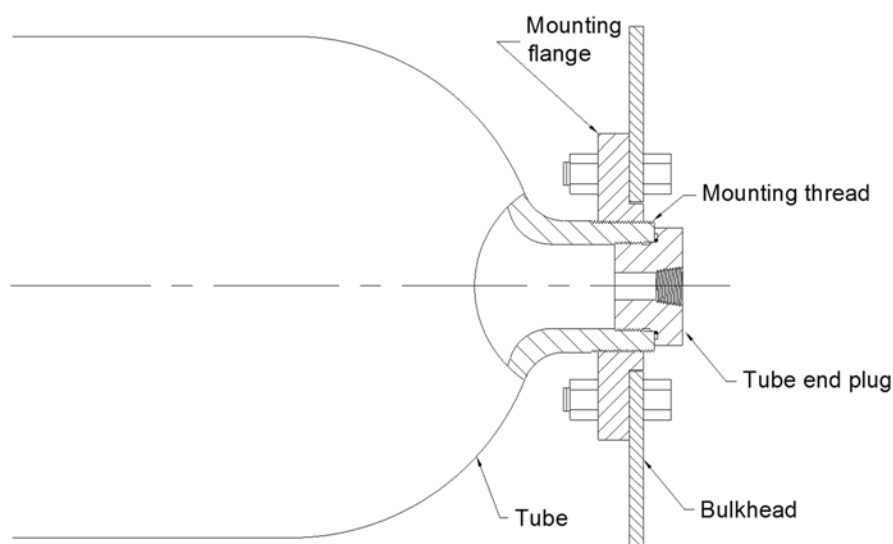


Figure 1—Illustration of mounting of tube using mounting flange

2 Scope

This publication applies to the inspection and evaluation of [DOT/TC 3-Series](#) and [ISO 11120](#) tubes 12 ft (3.7 m) or longer with an outside diameter greater than or equal to 18 in (457 mm) that are supported by the neck mounting surface. It provides methods to assess the integrity of tube necks including, but not limited to, mounting threads, pin or set screw marks, and other damage to identify rejectable tubes. Tubes with a smaller diameter are outside the scope of this publication.

This publication also applies if a saddle unit is being reconfigured into a unit supported by mounting threads.

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

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 **Bulkhead**

Vertical steel plate located at one or both ends of the tube bundle on the equipment that provides structural support for the mounting of the tubes.

3.2.2 **Derating factor**

Numerical value representing the ratio of the shear load capacity of a mounting thread with a reduced thread height to the same thread with the full thread height per specification.

NOTE—The derating factors in this publication were developed by experimental testing using subsized threaded specimens that were uniformly machined to remove a percentage of the thread height. These subsized threaded specimens were subjected to a tension load to measure the shear load at failure of the thread with the reduced thread height compared to a comparable thread with the full thread height per specification.

3.2.3 **Equipment**

Structural framework supporting pressure vessels used for the transportation of compressed gases.

NOTE—These framed assemblies are also known as tube trailers, tube modules, and/or tube bundles.

3.2.4 **Equivalent threads**

Number of threads multiplied by the derating factor.

NOTE—Equivalent threads are calculated by measuring, recording, and classifying the remaining neck threads into four wear categories and applying the appropriate derating factors.

3.2.5 **Inspection location**

Point on the circumference of the mounting thread identified for evaluation under 6.4.

3.2.6 **Local thin area (LTA)**

Section on the tube neck mounting surface where the neck wall is reduced in thickness.

3.2.7 **Major diameter**

Diameter of a thread measured across the crests of the threads for an external thread or across the roots of the threads for an internal thread.

NOTE—This value corresponds to the thread size designation for the thread.

3.2.8 Mounting flange

Circular disk threaded onto the mounting threads of a tube and subsequently bolted to the bulkhead to attach the tube to the equipment.

3.2.9 Mounting threads

External threads cut on the outside surface of the necks of a tube.

3.2.10 Residual strength factor (RSF)

Ratio of the strength in bending of a tube neck containing a flaw to the strength in bending of the same tube neck without the flaw.

3.2.11 Saddle

Clamp device used to provide structural support of a tube on the straight cylindrical portion rather than by a mounting flange securing the tube to a bulkhead by means of mounting threads.

3.2.12 Sleeve (collar)

Intermediate threaded component between the flange and the tube that engages all available threads on a tube neck.

3.2.13 Tube

Seamless pressure vessel authorized for transportation only when horizontally mounted on a motor vehicle or in an International Organization for Standardization (ISO) framework or other framework of equivalent structural integrity.

3.2.14 Tube bundle

Group of tubes and their related attachments such as bulkheads and saddles.

NOTE—This grouping of tubes and related attachments and framework cannot transport hazardous materials independent of the tube trailer or tube module.

3.2.15 Tube module

Assembly, comprised of a tube bundle mounted within a structural frame, which is designed to be temporarily mounted on a motor vehicle for transportation (see [CGA TB-25](#)) [1].

NOTE—This group of tubes and related attachments and framework form a standalone unit attached to the trailer chassis as a whole, separate, and distinct unit. Tube modules are also commonly known as skid containers, ISO skids, ISO containers, or multiple-element gas containers (MEGCs).

3.2.16 Tube trailer

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

4 Discussion about thread wear and local thin areas

4.1 General

To prevent the wear on the mounting threads of a tube from weakening the threaded connection to a point where safety can be compromised, the threads on the tube shall be inspected every 10 years after the previous inspection or as required by the authority having jurisdiction (AHJ). In the case of the due date of the tube neck inspection not aligning with the periodic requalification due date of the tube, an additional 2 years shall be allowed after the 10-year requalification due date to complete the tube neck inspection. After the expiry of the time period, including the 2-year grace period, tubes shall not be charged or filled but may be transported for the purposes of draining, purging, and performing required inspections. This inspection shall be performed by visual inspection after disassembly and measurement of the thread wear when necessary. Visual inspection requires removal of the mounting flanges. When evaluating the mounting threads on tubes, there are two basic categories of thread degradation that shall be evaluated:

- generalized external thread wear; and
- isolated thread wear.