

CGA C-6.2—2009

**GUIDELINES FOR
VISUAL INSPECTION AND
REQUALIFICATION OF
FIBER REINFORCED
HIGH PRESSURE
CYLINDERS**

SIXTH EDITION



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NOTE—Technical changes from the previous edition are underlined.

NOTE—Appendices A and B (Informative) are for information only.

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1 Introduction

Composite high pressure cylinders have been used in commercial service since 1976. Several million composite cylinders are currently in service. These cylinders have been manufactured under various government standards including:

- Exemptions/special permits granted by the U.S. Department of Transportation (DOT) based on:
 - DOT FRP-1 Standard, *Basic Requirements for Fiber Reinforced Plastic Type 3FC Composite Cylinders*, for full-wrapped cylinders [1]¹
 - DOT FRP-2 Standard, *Basic Requirements for Fiber Reinforced Plastic Type 3HW Composite Cylinders*, for hoop-wrapped cylinders [2]
 - *Basic Requirements for Fully Wrapped Carbon-Fiber Reinforced Aluminum Lined Cylinders* (DOT-CFFC), for carbon full-wrapped cylinders [3];
- Transport Canada (TC) Specifications TC-3FCM for full-wrapped cylinders and TC-3HWM for hoop-wrapped cylinders, as specified in CSA B339, *Cylinders, Spheres, and Tubes for the Transportation of Dangerous Goods* [4]; and
- Special Permits issued by the former Canadian Transport Commission (CTC) and Permits for Equivalent Level of Safety issued by TC in *Transportation of Dangerous Goods Regulations*, Part 14 [5].

The technology for these cylinders was developed by the aerospace industry during the 1960s for rocket motor cases and other pressure vessels. Composite cylinders have successfully provided high pressure gas containment for those applications where minimal weight and high strength is critical or desired.

2 Scope and purpose

2.1 Scope

This publication addresses the techniques for the inspection and requalification of composite overwrapped high pressure cylinders. The use of this publication is required in the United States by Title 49 of the U.S. *Code of Federal Regulations* (49 CFR) Part 180.205(f)(1), and in Canada by CSA B339, Section 24 [6, 4]. The requalification consists primarily of an internal and external visual inspection followed by hydrostatic testing. This publication highlights those items essential for an accurate appraisal of a composite overwrapped cylinder for compressed gas service. For information on requirements of general cylinder inspection and requalification (visual inspection and hydrostatic testing), refer to the publications listed in Section 3.

It is important to be aware of the design life of the cylinder before filling or requalifying. The user or requalifier must consult the appropriate special permit, permit, or specification to determine the appropriate design life. The composite cylinder shall be removed from service and condemned at the termination of the cylinder design life (i.e., the appropriate period in years following the original manufacturer's test date). Failure to do so is in direct violation of federal regulations and can increase the risk to public safety.

Not all of the considerations for requalification (visual inspection and hydrostatic testing) of composite cylinders are covered in this publication. Questions regarding specific cylinders should be directed to the manufacturer.

2.2 Purpose

The purpose of this publication is to provide sufficient data and details about composite cylinders so an experienced cylinder requalifier registered with the DOT, TC, or both can examine and hydrostatically test these cylinders to the requirements of the specific exemptions/special permits, permits, or specifications.

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