

# FESHM 5034.1: RETESTING PROCEDURES FOR D.O.T. GAS STORAGE CYLINDERS INCLUDING TUBE TRAILERS

(Formerly Fermilab Engineering Standard SD-36)

## Revision History

Author	Description of Change	Revision Date
Lidija Kokoska	<ul style="list-style-type: none"><li>Responsibilities section expanded and updated to align with new organization structure.</li><li>The outdated 49 CFR 173.34 references have been changed to 49 CFR 180, Subpart C.</li><li>“Test Operator” has been changed to “Test Coordinator” to align with the roles defined in FESHM 5034.</li></ul>	January 2023
Dave Pushka	<ul style="list-style-type: none"><li>Added requirement for an engineering note for derated cylinders.</li><li>Expanded scope to include all DOT vessels.</li><li>Clarified testing and documentation requirements.</li></ul>	October 2017
Thomas Page	Added FESHM Chapter template.	September 2011

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## 1.0 INTRODUCTION

Gas storage cylinders are a separate class of pressure vessels, loaded to nominally 80% higher stress values than permitted by the A.S.M.E. Code, the established pressure vessel standard at the Laboratory. These cylinders are built to rigorous specifications for fabrication, inspection and testing published by the Department of Transportation (DOT)<sup>1</sup>.

This chapter states the reinspection and retesting procedures policy regarding cylinders owned by Fermilab (or by experimenters when used onsite). Commercially owned cylinders must be maintained to Department of Transportation standards by their owners.

This chapter applies only to the cylinder specifications listed in 49 CFR 180, Subpart C.

## 2.0 RESPONSIBILITIES

### 2.1 Division/Project Head

The Division or Project head that controls the area of operations where the Fermilab-owned gas storage cylinders reside are responsible for carrying out the requirements of this chapter. They shall:

- (1) Continues the registration, retesting, and maintenance of the cylinder as a DOT cylinder by ensuring a qualified outside firm executes the retest and reinspection requirements for cylinder DOT certification.
- (2) Arrange for the review, derating, and retesting of the cylinder by a qualified person to maintain the equipment as a Derated Cylinder
- (3) Signs the Derated Cylinder inspection and test report
- (4) Certify cylinder compliance with this chapter by signing the Engineering Note associated with a Derated Cylinder as a pressure vessel

### 2.2 Lead Engineer

The Qualified person with overall responsibility for preparing the Engineering Note and Pressure Test Permit for a Derated Cylinder.

### 2.3 Test Operator

- (1) Responsible for the test setup, conducting the pressure test, and recording the results
- (2) Signs the Derated Cylinder inspection and test report

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<sup>1</sup>Cylinders are fabricated under Articles starting with 178.37 in Title 49 of the Federal Code of Regulations. The qualification, maintenance and use of these cylinders is covered by Article 180, Subpart C of the same Title. In addition, care, handling and inspection requirements are stated beginning with OSHA Article 1910.166. Contact the ES&H Section for the latest revision of these documents.



- 37  
38 **2.4 Division Safety Officer (DSO)**  
39 (1) Reviews the cylinder undergoing pressure testing and the surrounding area prior to the  
40 Pressure Test  
41 (2) Provides approval to commence with pressure testing  
42 (3) Witnesses the pressure test  
43 (4) Signs the Derated Cylinder inspection and test report  
44

- 45 **2.5 Mechanical Safety Subcommittee**  
46 (1) Available to advise and assist Division or Project personnel with pressure testing  
47 (2) Provides a qualified contact as an Engineering Note Reviewer to:  
48 a. Review the Engineering Note and Pressure Test Permit for Derated Cylinders  
49 as a pressure vessel  
50 b. Once FESHM requirements are satisfied, provide recommendation to the DSO  
51 and Lead Engineer to proceed with the Pressure Test  
52 c. Review the completed Pressure Test Permit  
53 d. Signs the Derated Cylinder inspection and test report  
54

## 55 **3.0 PROCEDURES**

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### 58 **3.1 Retest and Re-inspection Options**

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60 When cylinders become due for re-inspection and for retesting (every five years or as  
61 required in 49 CFR 180.209), division heads controlling their use have the option of  
62 continuing their registration by maintaining the cylinders as DOT cylinders, or  
63 derating the cylinders to the requirements of the A.S.M.E. Pressure Vessel Code.  
64

65 A cylinder that was filled prior to its requalification period, may remain filled until  
66 emptied. If a requalification is due, the cylinder cannot be re-filled until the  
67 requalification has been successfully completed.  
68

### 69 **3.2 Maintaining the Cylinders as DOT Certified**

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71 Retesting and re-inspection of the cylinders to maintain their DOT certification  
72 includes rigorous pressure testing conducted by outside firms involving disassembly  
73 of the tube bank and volumetric expansion determination of the cylinders at 5/3 of  
74 the operating pressure. Bore scope inspection for indications of internal corrosion and  
75 refurbishment and testing of relief devices is included.  
76

### 77 **3.3 Derating and Retesting Cylinders to A.S.M.E Code**

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Cylinders that are used exclusively onsite may be taken out of DOT classification and derated to 55%<sup>2</sup> of their DOT operating pressure. This is the maximum operating pressure allowed by the A.S.M.E. Pressure Vessel Code. These cylinders shall be subjected to the above DOT inspection requirements except a hydrostatic or pneumatic pressure test in accordance with current ASME Section VIII, Division 1 of the "derated maximum operating pressure" shall substitute for the hydrostatic expansion test. This test shall be witnessed by the Division Safety Officer (DSO) or designee. Members of the Mechanical Safety Subcommittee are available for consultation.

### 3.3.1. Cylinder Marking

Such derated cylinders shall each be identified with a metal collar, permanently attached to the neck. It shall be stamped or permanently printed with the following text:

**DERATED CYLINDERS  
SHALL NOT BE USED  
IN PRESSURIZED MODE  
OFF FERMILAB SITE  
DERATED MAXIMUM OPERATING PRESSURE  
\_\_\_\_\_ PSI  
INSPECTED AND TESTED TO  
\_\_\_\_\_ PSI ON DATE \_\_\_\_\_  
RETEST ON OR BEFORE \_\_\_\_\_**

In addition, each separately used cylinder shall have imprinted in letters 1" high, or for tube trailers both sides shall have imprinted in letters 3" high:

**"DERATED CYLINDERS, DO NOT USE OFF FERMILAB SITE"**

### 3.3.2. Reports

An inspection and test report listing cylinder serial number(s) shall be filled out with suitable inspection comments and test pressures. It shall be signed by the test operator, the division safety officer and a member of the Mechanical Safety Subcommittee and shall be filed by the responsible division in a FESHM 5031 engineering note.

### 3.3.3. Relief Devices for Derated Cylinders

<sup>2</sup>For cylinders built to DOT Specification 107A, the derating factor is 75%.



120 Relief devices shall be refurbished, rupture disks changed and relief valves  
121 cleaned and tested. The "begin to discharge" settings of the rupture disks and  
122 relief valves shall be no greater than 100% of the derated maximum allowable  
123 pressure.

124  
125 Relief devices are subject to the relief device inspection and testing  
126 requirements in FESHM 5031.4. Derated cylinder may require de-pressurizing  
127 for periodic relief device inspection and testing.

128  
129 **3.3.4. Engineering note requirement and FESHM 5031**

130 Derated cylinders shall have a FESHM 5031 engineering note prepared by the  
131 Lead Engineer to document the use as a pressure vessel.

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