



Standard Practice for Transfilling Compressed Air or Nitrogen and Safe Handling of Small Paintball Cylinders¹

This standard is issued under the fixed designation F2773; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

INTRODUCTION

This standard is intended to provide basic procedures for the safe handling and transfilling of small (not bulk) paintball compressed air cylinders commonly used with a paintball marker for propulsion of a paintball.

This practice is written within the current state-of-the-art of transfilling compressed gas technology. The intent is to revise this specification whenever substantive information becomes available which justifies revising existing requirements or adding new requirements.

1. Scope

1.1 This practice is intended to satisfy the demand for information on the basic procedures for the safe handling and transfilling of small (not bulk) paintball compressed air cylinders commonly used with a paintball marker for propulsion of a paintball. This standard does not address issues dealing with the transfilling, storage, and handling of supply cylinders that may be used in transfilling smaller cylinders.

1.2 The compressed air fill procedures are written for the pressure cylinder transfilling method most commonly used by paintball field or store operators, or both.

1.3 This document should not be confused with federal, state, provincial, or municipal specifications or regulations; insurance requirements; or national safety codes.

1.4 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations, such as and not limited to DOT, CGA, and OSHA, prior to use.*

1.6 *This international standard was developed in accordance with internationally recognized principles on standard-*

ization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

2. Referenced Documents

2.1 ASTM Standards:²

[F1979 Specification for Paintballs Used in the Sport of Paintball](#)

[F2030 Specification for Paintball Cylinder Burst Disk Assemblies](#)

[F2272 Specification for Paintball Markers](#)

2.2 CGA Standards:³

[CGA C-6.1 Standards for visual inspection of high pressure aluminum compressed gas cylinders](#)

[CGA C-6.2 Guidelines for visual inspection and requalification of fiber reinforced high pressure cylinders](#)

2.3 Federal Standards:⁴

[CFR 49 Parts 100 to 185](#)

3. Terminology

3.1 Definitions:

3.1.1 *blow-down valve, n*—valve which is part of a fill station assembly, and which is intended to vent gas from the paintball cylinder being filled.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Available from Compressed Gas Association (CGA), 4221 Walney Rd., 5th Floor, Chantilly, VA 20151-2923, <http://www.cganet.com>. Available from

⁴ Available from U.S. Government Printing Office Superintendent of Documents, 732 N. Capitol St., NW, Mail Stop: SDE, Washington, DC 20401, <http://www.access.gpo.gov>.

¹ This practice is under the jurisdiction of ASTM Committee F08 on Sports Equipment, Playing Surfaces, and Facilities and is the direct responsibility of Subcommittee F08.24 on Paintball and Equipment.

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3.1.2 *fill station, n*—device designed to attach to a supply cylinder and to a paintball cylinder which facilitates transfilling the paintball cylinder.

3.1.3 *paintball, n*—spherical ball, commonly with a diameter of 0.68 in. (17.3 mm), comprised of a shell and a fill, conforming to Specification F1979 and designed to be expelled from a paintball marker conforming to Specification F2272.

4. General Considerations

4.1 Persons, who are transfilling compressed air, should be trained in the hazards associated with compressed air or nitrogen, or both.

4.2 Always wear eye protection while filling cylinders.

4.3 Always have any required MSDS at the location that the filling takes place.

4.4 Always read and understand all fill station instructions.

4.5 Ensure that there is proper ventilation in the filling area.

4.6 The receiving cylinder (paintball cylinder) must be of a refillable type (that is, not disposable) and pressure rating that it can safely hold stamped or marked on the cylinder.

4.7 Supply cylinders must be secured and supported, such as fastened to a wall or similar immovable structure (that is, not free standing).

5. Fill Stations

5.1 Fill stations and related equipment should be rated the same as the supply tank.

5.2 Fill stations should be used for the purpose of transfilling compressed air or nitrogen, or both, for the paintball industry only.

5.3 Fill stations shall be supplied with instructions by the manufacturer or distributor of the product.

5.4 Fill stations should be marked or tagged with safety warnings.

5.4.1 Read owners manual before using.

5.4.2 Use only with compressed air or nitrogen.

5.4.3 Do not use for oxygen.

5.4.4 Close bulk tank valve when not in use.

5.4.5 Vent down system.

5.4.6 Never add or introduce oil to the fill station, cylinder, or regulator/valve.

6. Cylinder Inspection

6.1 Ensure that the regulator is properly attached to the cylinder.

6.2 Ensure that the regulator is in good, serviceable condition.

6.2.1 Ensure that the proper cylinder safety burst disk is installed correctly.

6.3 Visually inspect the cylinder condition before each fill.

6.3.1 Cylinders must be stamped or labeled with a DOT (Department of Transportation) or potentially TC (Transport Canada) mark working pressure, manufacturer’s code or name, serial number, and hydrostatic test date.

6.3.1.1 An example of an aluminum cylinder shoulder stamping:

TC – 3ALM | 310

DOT - 3AL | 4500 | A12345 | LUXFER | 12 ^ 04

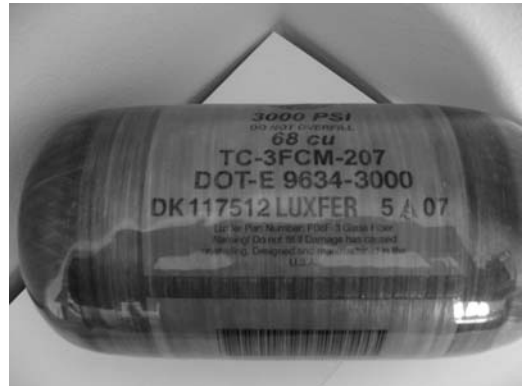
6.3.1.2 DOT – 3AL 3000 M4625 04^03 A051391

The cylinder neck layline translates as follows:

DOT	Department of Transportation (a Federal Agency)
3AL	The specification standard the cylinder conforms to
3000	The working pressure rating of the cylinder
M4625	The manufacturer’s name or number of the cylinder
04^03	The hydrostatic test date of the cylinder. The first two digits are the month. The ^ is the testing agency mark. The last two digits are the year. The above date would be valid to use until April 1, 2008.
A051391	The serial number of the tank.

NOTE 1—Re-qualification period for cylinders is typically five (5) years for 3 AL aluminum cylinders.

(1) An example of a composite wrapped tank label:



The label translates as follows:

68cu	Cylinder size in cubic inches
TC-3FCM-207	Transport Canada approval
DOT	Department of Transportation
E9634	Exemption number
3000	Cylinder working pressure
DK 117512	The serial number of the tank
LUXFER	Cylinder manufacturer
5 ^ 07	The hydrostatic test date of the cylinder The first two digits are the month The ^ is the testing agency mark The last two digits are the year The above date would be valid to use until May 1, 2010

(2) After hydrostatic testing, the retest date will look like this:



Label attached to bottle with epoxy

TABLE 1 Examples of DOT Exemption (E) and Special Permit Numbers

Exemption #	Manufacturer	Retest Due Every
E-07277	SCI	3 Years from manufacturing date or last retest.
E-09634	LUXFER	3 Years from manufacturing date or last retest.
E-10915	LUXFER	Manufactured or last retest before May 2001. 3 years. Manufactured or last retest June 2001. 5 years.
E-10945	SCI	Manufactured or last retest before July 2001. 3 years. Manufactured or last retest tested August 2001. 5 years.
E-11005	Carleton Tech	Test every 3 years.
E-11194	Carleton Tech	Manufactured or last re-test before July 1, 2001. 3 years. Manufactured or last re-test tested August 2001. 5 year cycle.
E-12479	LUXFER	3 years.
E-12695	Global Composites International	DO NOT USE. D.O.T. HAS SUSPENDED THIS EXEMPTION NUMBER. Contact GCI for instructions.

G7

12 77 07

The first two digits are the month

The G7 is the re-testing agency RIN (Re-testers identification number)

77

The RIN number is read in a clock wise direction, G777

Contact D.O.T. for RIN information

The last two digits are the year

The above date would be valid to use until December 1, 2010

(3) Another example:



The cylinder label translates as follows:

DOT	Department of Transportation (a Federal Agency)
SP14387	The exemption standard the cylinder conforms to
4500	The working pressure rating of the cylinder
GC9468S1-D2	D2 manufacturers part number
W102614	Cylinders serial number
M4625	The manufacturer's name or number
REE	The rejection elastic expansion number – used for hydrostatic testing
01 ^ 08	The hydrostatic test date of the cylinder
	The first two digits are the month
	The ^ is the testing agency mark
	The last two digits are the year
	The above date would be valid to use until January 1, 2013

6.3.1.3 **Table 1** lists some examples of exemption (E) or special permit (SP) numbers. Always refer to DOT for current information.⁵

6.3.2 The pressure rating on the label or stamped on the cylinder must be at least 3000 psi or higher.

6.3.3 Cylinders should be in good condition, that is, free of stickers, paint, anodizing, dents, scrapes, or gouges.

6.3.4 Cylinders should not be buffed or polished.

6.3.5 Burst disk assemblies will meet the requirements of Specification **F2030**.

⁵ Exemption or Special permit number may also be referenced at the following link: http://hazmat.dot.gov/sp_app/special_permits/spec_perm_index.htm.

6.3.5.1 Cylinders having regulator valves without a burst disk or pressure relief mechanism installed must not be filled (see **Fig. 1**).

6.3.5.2 The pressure relief or burst disk assembly should be tight and visible pressure relief passages should be clear of obstructions. See **Fig. 2**.

6.3.5.3 All regulator valves must have the correct burst disk (see **Table 2**), as required by DOT part 49 CFR.

6.3.6 The regulator valve and external threading must not be damaged and must be free of foreign material. Damaged regulators or components must be cleaned or repaired by the manufacturer or its authorized representative prior to filling the cylinder.

6.4 Cylinders must NOT be filled if any one of the following conditions exists:

6.4.1 Cylinders are outside the valid test date range. Always confirm re-qualification period through DOT.

6.4.2 Presence of water or other liquids in the cylinder.

6.4.3 Evidence of internal contamination such as rust or other particles.

6.4.4 External corrosion exceeding 0.032 in. (0.8 mm) in depth or 25 % of surface area.

6.4.5 Dents in aluminum bottles that exceed 0.062 in. (1.6 mm) with a diameter less than 2 in. (50.8 mm).

6.4.6 Scrapes or gouges that decrease the wall thickness of a cylinder by an appreciable amount.

6.4.7 Visible bulges.

6.4.8 Cylinders show evidence of polishing, buffing, welding, grinding, sandblasting, plating, or exposure to high temperature over 350°F/177°C.

6.4.9 Delaminating of composite cylinders.

6.4.10 Any damage that exposes any fibers on a composite cylinder.

6.4.11 Any other conditions that seem unsafe to use should not be filled and should be inspected by a certified DOT re-tester.

7. Compressed Air/Nitrogen Fill Procedures

7.1 The safety relief device, cylinder wall, and regulator of all cylinders to be transfilled must be inspected as described in Section 6. If a condition not described in Section 6 is found and is of concern of the person transfilling the cylinder, the cylinder must not be filled.

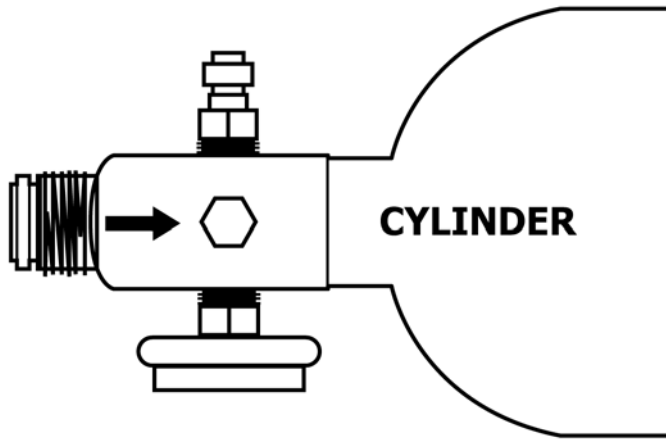


FIG. 1 Arrow Indicates One Common Style of the Multiple Burst Disk Assemblies that May Be Present on a Regulator Valve



FIG. 2 Pin Valve Showing Example of Burst Disk Assembly Relief Hole

7.2 The pressure rating stamped or labeled on the cylinder must meet or exceed the intended fill pressure.

7.3 The female quick disconnect must be inspected for proper pressure rating and for wear on the retaining ball bearings. The male fill valve must also be inspected for burnelling on the retaining ring area. Any type of hosing or transfer line must also be inspected for proper pressure rating.

7.4 Attach the fill station to the supply cylinder. Ensure that the proper CGA fittings are used and installed correctly.

TABLE 2 Cylinder Working Pressure and Burst Disk Reference Chart

Cylinder Working Pressure	Burst Disk
1800 psi	3000 psi (3K)
3000 psi	5000 psi (5K)
4500 psi	7500 psi (7.5K)

7.5 Attach the paintball cylinder to the fill station using the male fill valve only. Ensure that the female quick disconnect is fully seated and closed.

7.6 Holding onto the bottle or hose, or both, slowly open the supply valve and fill the cylinder to the designated fill pressure. Check the output gauge on the fill station to ensure no over pressurization has occurred. Vent immediately if cylinder has been over pressurized.

7.6.1 The fill rate should be conducted at a speed that minimizes heat build up. Care must be taken to fill the cylinder at a rate so the cylinder temperature does not become too hot to hold in your bare hands, 140°F/49°C.

7.7 Close the supply valve, and open the blow-down valve to relieve the pressure in the transfer line. If the system is leaking through the venting valve, do not remove the cylinder until all air has stopped.

7.7.1 If the system leaks through the blow-down valve then the fill valve assembly on the system needs to be serviced by the manufacturer or its authorized representative. Do not add oil to the system.

7.8 Remove the cylinder from the fill station. If the female quick disconnect slide does not move easily, this may indicate that pressure is still present in the system. Do not remove with pressure still in fill system.

7.9 Turn off the supply tank, safely vent down the fill station and if possible, remove or secure any hoses.

8. Keywords

8.1 aluminum; burst disk, carbon fiber; composite; compressed gas; cylinder; paintball; pressure vessel; transfilling

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