

**State of New Jersey  
Department of Community Affairs  
Department of Health and Senior Services**

**PUBLIC HEALTH ALERT**

**Self-Contained Breathing Apparatus Cylinders Failure**

November 1996

Since July 1996, there have been two catastrophic failures of self-contained breathing apparatus (SCBA) cylinders in New Jersey. The first occurred in Morris County, and resulted in severe injuries to a firefighter. The second occurred in Somerset County, and also resulted in injuries to a firefighter. These injuries occurred while the SCBA cylinders were being filled.

Both cylinders have been impounded by the US Department of Transportation (DOT), which has jurisdiction over this type of cylinder. The DOT will test the cylinders to attempt to determine the cause of the cylinder failures. The cylinder testing will attempt to determine if there were any defects in the cylinders, or if the cylinders were overfilled, or whether a combination of factors caused the cylinders to fail.

It is important to note that in both of these incidents, the SCBA cylinders were being filled from cascade systems that were not equipped with pressure regulators or fragmentation shields. The Public Employees Occupational Safety and Health (PEOSH) Standards for Firefighters has requirements (N.J.A.C. 12:100-10.14) for SCBA cylinders. The purpose of these requirements is to minimize the potential for injury to firefighters or near-by personnel in the event that an SCBA cylinder should fail while filling.

The PEOSH Standards for Firefighters as a minimum require:

- personnel filling SCBA cylinders receive training,
- the charging station must be equipped with facilities to ensure the safety of the charging station operator and nearby personnel, and
- the air used to fill the cylinders must comply with requirements for Grade D breathing air.

Training must include:

- procedures for inspecting the SCBA cylinder for damage,
- information to ensure that the cylinder has the proper hydrostatic test date,
- information to ensure that composite cylinders older than 15 years are not refilled and removed from service,
- procedures to safely operate the charging station,
- the fill station manufacturer instructions for safe filling,
- information on the importance of using at least Grade D air, and
- information on the consequences of cylinder failure.

The PEOSH Standard requires that the charging station be equipped with:

- an adjustable pressure regulator,
- a regulated pressure gauge,
- an inlet pressure gauge,
- a fill control valve,
- isolation valves (for cascade filling),
- fill hose with bleed valves, and
- a fragmentation shield that would contain the cylinder in the event of failure.

**If a cylinder is found empty and it is not known how it was emptied (used in training, during a response, etc.), do not re-fill the cylinder until it is determined that the cylinder can be safely re-filled. It is possible that the cylinder has a flaw that caused the cylinder to leak.**

In addition, fire departments should follow the attached DOT, Safety Advisory. The precautionary measures outlined in this Safety Advisory should be implemented. These precautionary measures include:

- Determine if the fire department has any cylinders made of aluminum alloy 6351-T6. For aid in determining whether a cylinder is made of aluminum alloy 6351-T6, contact the cylinder manufacturer or distributor ;
- Do not overfill a cylinder to greater than the marked service pressure;
- Do not fill a cylinder that is beyond its required retest date;
- Do not use a cylinder that is beyond its required retest date;
- By May 1997, the interior of any cylinder made of aluminum alloy 6351-T6 should be inspected for cracks in the neck and shoulder area. Any evidence of a crack or crack-like defect may require further evaluation.

This alert should be posted by the cascade filling area and a copy of this alert provided to personnel responsible for filling SCBA cylinders.

This alert, which was developed jointly by the New Jersey Department of Community Affairs, Division of Fire Safety and the New Jersey Department of Health and Senior Services, Public Employees Occupational Safety and Health (PEOSH) Program, is being provided to the fire service and local health departments in New Jersey.

If you have any questions concerning this alert, please call the PEOSH Program at (609) 984-1863.

[Federal Register: July 26, 1994]

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DEPARTMENT OF TRANSPORTATION  
Research and Special Programs Administration  
[Notice No. 94-7]

Safety Advisory; High Pressure Aluminum Seamless and Aluminum Composite Hoop-Wrapped Cylinders

AGENCY: Research and Special Programs Administration (RSPA), DOT.

ACTION: Safety advisory notice.

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SUMMARY: RSPA is aware of ruptures involving two DOT-3AL cylinders made of aluminum alloy 6351-T6. Cylinder ruptures pose a risk of death, serious personal injury, and property damage. The purpose of this notice is to advise owners of certain cylinders made of aluminum alloy 6351-T6 to follow the precautionary measures outlined in this notice. RSPA also seeks information on ruptures involving other cylinders made of aluminum alloy 6351-T6.

FOR FURTHER INFORMATION CONTACT: Charles H. Hochman or Gopala K. Vinjamuri, telephone (202) 366-4545, Office of Hazardous Materials Technology, Research and Special Programs Administration, U.S. Department of Transportation, 400 Seventh Street SW, Washington, DC 20590-0001. Office hours are: 8:30 a.m. to 5 p.m., Monday through Friday, except holidays.

SUPPLEMENTARY INFORMATION: RSPA has been notified of the rupture of two DOT-3AL aluminum cylinders made of aluminum alloy 6351-T6. The first cylinder rupture occurred in Deer Park, Texas. This cylinder was manufactured in 1977 and was part of a self-contained breathing apparatus (SCBA) unit. It ruptured while being filled to its marked service pressure of 2216 pounds per square inch gauge (psig). The second cylinder rupture occurred in North Miami, Florida. This cylinder was manufactured in 1982 and was part of a self-contained underwater breathing apparatus (SCUBA) unit. It ruptured while being filled to its marked service pressure of 3000 psig. The person filling the SCUBA cylinder sustained serious injury. In both ruptures, a piece of the cylinder neck separated from the cylinder.

RSPA estimates that approximately seven million cylinders have been manufactured using aluminum alloy 6351-T6. RSPA presently does not know which cylinders among this population have the potential for similar failure. Cylinders made of aluminum alloy 6351-T6 are known to be susceptible to sustained load cracking (SLC) in the neck and shoulder area of the cylinder. Extensive research, testing and analysis have been performed on cylinders made of aluminum alloy 6351-T6 to determine any correlation

between SLC and the probability of rupture. Findings indicated that cylinders with a marked service pressure below 4000 psig failing due to SLC would leak and not rupture. Present data are inconclusive as to why the two cylinders noted here ruptured instead of leaked. RSPA is continuing to investigate the incidents.

Aluminum cylinders are widely used in industrial, medical, SCUBA and SCBA services. Aluminum alloy 6351-T6 has been used in the manufacture of the following DOT high pressure cylinders:

1. Cylinders (seamless aluminum) marked "DOT 3AL", including those marked with "DOT 3AL" above or near one of the following exemption or special permit numbers:

6498  
7042  
8107  
8364  
8422

2. Composite cylinders (aluminum-lined with hoop-wrapped, fiber-reinforced plastic) marked with one of the following exemption numbers:

7235  
8023  
8115

To RSPA's knowledge, no cylinders have been manufactured under the exemption or special permit numbers listed above, except DOT-E 7235, since 1984. Any cylinder marked with one of these exemption or special permit numbers most likely is made of aluminum alloy 6351-T6 (DOT-E 7235 cylinders are discussed more fully below). If in doubt, contact the cylinder manufacturer or distributor to identify the material of construction.

The primary domestic manufacturers of DOT-3AL cylinders currently in service are Luxfer USA; Walter Kidde Co.; Cliff Impact Division of Parker Hannifan Corporation; and Catalina Cylinders, a Division of Aluminum Precision Products Inc. Luxfer USA is the only manufacturer of DOT-E 7235 cylinders. Between 1987 and 1989, Luxfer USA discontinued using alloy 6351-T6 and changed to alloy 6061-T6 for DOT-3AL cylinders and DOT-E 7235 cylinder liners. Cylinders manufactured from alloy 6061-T6 are not believed to be susceptible to SLC; therefore, they are not subject to this advisory notice. According to Luxfer USA data, the following types of cylinders stamped as manufactured by Luxfer USA before the dates indicated below likely are made from alloy 6351-T6.

DOT	Service and type cylinder	Part no.	Date mfd.
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Spec. 3AL	1.2 and 1.5 lb.	C1.2, C1.5	1-89
Do	2.18 lb.	C2-18	11-88
Do	10 lb.	C10	8-88
Do	5 lb.	C5	6-88
Do	15 lb.	C15	11-87
Do	20 and 35 lb.	C20, C35	4-88
Do	50 lb.	C50	2-88

## SCBA

Do	7, 8 and 13 cu. ft.	L7, L8, L13	9-87
Do	13.3 cu. ft.	L13-30	5-88
Do	15 cu. ft.	L15	1-89
Do	26 cu. ft.	L26	2-88
Do	45 cu. ft.	L45	11-87

## SCUBA

Do	30 and 63 cu. ft.	S30, S63	5-88
Do	40 cu. ft.	S40	6-88
Do	50 and 92 cu. ft.	S50, S92	4-88
Do	72 and 100 cu. ft.	S72, S100	8-87
Do	80 cu. ft.	S80	1-88
Do	80.8 cu. ft.	S80.8	5-87

## Medical O1

Do	C	M9	1-88
Do	D and E	MD, ME	12-87

## Industrial

Do	22 and 150 cu. ft.	N22, N150	5-88
Do	33 cu. ft.	N33	11-88
Do	60 and 122 cu. ft.	N60, N122	12-87
Do	88 cu. ft.	N88	12-88
Do	Service Pressures 2016 and 3000 psig		8-89
E-7235	Service Pressure 4500 psig		See below.

All Walter Kidde DOT-3AL cylinders, of which production ceased in January 1990, are made of alloy 6351-T6. Cliff Impact DOT-3AL cylinders were made from alloy 6351-T6 before July 1990, at which time Cliff Impact changed to alloy 6061-T6. Catalina Cylinders did not produce any DOT-3AL cylinders from alloy 6351-T6; therefore, cylinders manufactured by Catalina are not subject to this notice.

Until determined otherwise, any DOT-3AL or DOT-E 7235 cylinder should be assumed to be made of alloy 6351-T6, if it was:

1. Manufactured by Luxfer USA before the applicable date listed in the chart above;
2. Manufactured by Cliff Impact before July 1990;
3. Manufactured by any other company in the United States, excluding Catalina, before February 1990, or
4. Manufactured outside the United States.

For aid in determining whether a cylinder is constructed with alloy 6351-T6, contact the cylinder manufacturer or distributor. RSPA will provide further information as it becomes available.

Any person who owns, uses, fills or retests an affected cylinder should take the following precautions:

1. Do not fill the cylinder to greater than the marked service pressure, except during a hydrostatic test.
2. Do not fill a cylinder that is beyond its required retest date.
3. Do not use a SCUBA or SCBA cylinder that is beyond its required retest date.
4. Whenever you remove the cylinder valve, visually inspect the interior of the cylinder neck and shoulder area for cracks.

Any evidence of a crack or crack-like defect may require further evaluation. Contact the cylinder retester, distributor or manufacturer for the procedure to be used in performing the visual inspection and for rejection criteria. For guidance on inspecting Luxfer USA cylinders, contact Luxfer USA Limited, Customer Service Department, PO Box 5300, Riverside CA 92517, telephone (909) 684-5110.

RSPA wishes to reiterate two previous advisories it has issued regarding DOT-E 7235 cylinders. On August 15, 1985, RSPA published an exemption-related notice [Notice 85-4, 50 FR 32944] to alert users that any cylinder marked DOT-E 7235, with a service pressure of 4500 psig and not equipped with a neckring was required to be removed from service by October 1, 1985. On March 24, 1993, RSPA published a safety advisory notice [Notice 93-8, 58 FR 15895] after being notified of the rupture of a cylinder authorized under DOT-E 7235 that had not been fitted with a neckring. Cylinders properly fitted with the required neckring are not susceptible to rupture. That notice stated in part:

Persons finding cylinders without the required neckring should immediately take the following precautions.

1. If a cylinder has been filled, its entire contents should be vented in order to relieve internal pressure.
2. The vented cylinders should be segregated from all other cylinders by being placed in a secured area and marked conspicuously with a tag bearing the notation "Do Not Use" or similar warning.
3. Under no circumstances should any of the cylinders in question be sold or otherwise transferred, filled, refilled or used for any purpose.

Once the above procedures have been taken, persons finding cylinders without neckrings should contact the company, or distributor from whom they were purchased, for their disposition.

Any person who is aware of the rupture of any DOT-3AL cylinder or any other cylinder manufactured from aluminum alloy 6351-T6, whether the incident was domestic or foreign, is requested to contact RSPA as soon as possible.

Issued in Washington, DC on July 20, 1994.

Alan I. Roberts, Associate Administrator for Hazardous Materials Safety.

[FR Doc. 94-18192 Filed 7-25-94; 8:45 am]

BILLING CODE 4910-60-P