

**DEPARTMENT OF TRANSPORTATION****Research and Special Programs  
Administration**

49 CFR Part 178

[Docket No. HM-176A]

**DOT 3AL Aluminum Cylinders; Safety  
Problems****AGENCY:** Research and Special Programs  
Administration (RSPA), DOT.**ACTION:** Safety advisory and advance  
notice of proposed rulemaking.**SUMMARY:** Cylinders made of aluminum alloy 6351 manufactured by Luxfer USA Limited in accordance with DOT Specification 3AL (49 CFR 178.46) have developed cracks during service, which occasionally result in leakage and the loss of cylinder contents. The purpose of this notice is to inform all persons that possess DOT 3AL cylinders of the problems, to identify those cylinders at risk, to suggest steps that should be taken to minimize risks, and to request comments concerning the extent of the problem and how to resolve it.**DATE:** Comments must be received by August 10, 1987.**ADDRESS:** Address comments to: Dockets Unit (DHM-30), Office of Hazardous Materials Transportation, RSPA, U.S. Department of Transportation, Washington, DC 20590. Comments should identify the docket and be submitted, if possible, in five copies. Persons wishing to receive confirmation of receipt of their comments should include a self-addressed stamped postcard. The Dockets Unit is located in Room 8-426, Nassif Building, 400 Seventh Street SW., Washington, DC 20590. Public Dockets may be reviewed between the hours of 8:30 a.m. and 5:00 p.m., Monday through Friday.**FOR FURTHER INFORMATION CONTACT:** Charles H. Hochman, Technical Division, Office of Hazardous Materials Transportation (OHMT), Research and Special Programs Administration, U.S. Department of Transportation, 400 Seventh Street SW., Washington, DC 20590, (202) 366-4545. Office Hours are 8:30 a.m. to 5:00 p.m.**SUPPLEMENTARY INFORMATION:** RSPA is aware of incidents of cracks in the neck and threaded areas of DOT 3AL cylinders manufactured by Luxfer USA Limited (Luxfer) from aluminum alloy 6351. The cracking was first brought to RSPA's attention by persons retesting cylinders under the periodic retest procedures of 49 CFR 173.34.

Five cylinders suspected of having cracks were sent by RSPA to the National Bureau of Standards (NBS) for analysis. They had marked service pressures ranging from 1800 through 2200 pounds per square inch gauge (psig) and were made of both high lead content (100 parts per million or more) and low lead content (less than 100 ppm) varieties of aluminum alloy 6351. The NBS inspection and examination confirmed that each of the five cylinders

exhibited crack-like indications which were at least 0.050 inch deep.

Following the NBS analysis, RSPA requested that Luxfer provide available information concerning leaks or cracks in DOT 3AL cylinders. Luxfer provided information on the number of cylinders returned because of cracks or leakage. This information revealed the following:

(1) Of 3,278 cylinders made of high lead aluminum alloy 6351 and with tapered threads, at least 33 (1.0%) are known to have leaked or had neck or shoulder flaws (i.e., cracks).

(2) Of 60,000 cylinders made of low lead aluminum alloy with tapered threads, 23 (0.038%) are known to have leaked or had neck or shoulder flaws.

(3) Of 312,000 cylinders made of high lead aluminum alloy 6351 with straight threads, 260 (0.086%) are known to have leaked or had neck or shoulder flaws.

(4) Of approximately 5.02 million cylinders made of low lead aluminum alloy 6351 with straight threads, 106 (0.002%) are known to have leaked or had neck or shoulder flaws.

RSPA believes that the above statistics underrepresent the extent of the cracking and leakage problems since NBS noted in its report that identification of cracking is very difficult even when an individual is specifically looking for cracks.

Work performed by Luxfer on neck cracking of DOT exemption hoop wrapped composite cylinders made of aluminum alloy 6351 (which have neck and shoulder areas identical to DOT 3AL cylinders but operated at a higher operating stress level) indicated that cracking is a time dependent phenomenon that is accelerated when the lead content of the alloy exceeds 100 ppm. Further, it was found that the probability of cracking increases with an increase in stress level. Analysis of the stress levels present in the necks of DOT 3AL cylinders indicated that higher stress levels are present in cylinders with tapered threads. This analysis, confirmed by the in-service data, shows that the probability of neck cracking is much higher in DOT 3AL cylinders with tapered threads. Based on Luxfer's analysis and testing, it is anticipated that the frequency of cracks and leakage will increase with the length of time these cylinders are in service. Analysis and testing performed by Luxfer also shows that, for typical DOT 3AL cylinders made of aluminum alloy 6351 (service pressure less than or equal to 3000 psig), the failure mode is by leakage of the cylinder contents and not by bursting. It should be noted that at the present time, only DOT 3AL cylinders made by Luxfer of aluminum alloy 6351 have been reported to RSPA

as having leaked or had neck or shoulder flaws (cracks). Other manufacturers of DOT 3AL cylinders made of aluminum alloy 6351 using different manufacturing processes have reported no leaks or neck or shoulder flaws in a total population in excess of 1 million cylinders. Further, all of the information available to RSPA indicates that cylinders made of aluminum alloy 6061, the other alloy authorized by specification DOT 3AL, are not susceptible to the cracking problems that have arisen in cylinders made aluminum alloy 6351.

DOT 3AL cylinders are authorized to be manufactured from two aluminum alloys, 6061 and 6351. Based on information presently available to DOT, the overwhelming majority of DOT 3AL cylinders produced have been made of aluminum alloy 6351. However, the number identifying the alloy used is not required to be stamped on the cylinder. The only way to determine which alloy was used to manufacture a DOT 3AL cylinder is through the cylinder manufacture using the serial number applied by the manufacturer when the cylinder was made.

DOT 3AL cylinders are authorized and used for the transportation of a number of extremely hazardous materials. These include poisonous and flammable gases, liquids which are toxic by inhalation (see 49 CFR 173.3a) and oxygen. It should be noted that tapered threads are required on cylinders used for Poison A materials, but not for other toxic gases that are not identified as Poison A materials such as diborane or hydrogen selenide.

RSPA is initiating rulemaking to correct any regulatory deficiencies concerning the manufacture, maintenance and use of cylinders made under specification DOT 3AL. In the interim, this notice serves to inform all persons in possession of DOT 3AL cylinders of the cracking problem, and recommends that those persons take the following steps to minimize risks:

#### DOT 3AL Cylinders Made of High Lead Aluminum Alloy 6351 With Tapered Threads

DOT 3AL cylinders made of high lead (greater than 100 ppm) aluminum alloy 6351 manufactured by Luxfer USA Limited in 1982 and 1983 bearing the serial numbers which appear in Appendix A to this document should not be refilled or used in hazardous materials service. Both RSPA and Luxfer have been in contact with the original purchasers of these cylinders and requested that the cylinders be removed from service and returned to Luxfer as soon as practicable. Persons in

possession of a cylinder listed in Appendix A should contact the cylinder supplier for proper disposition of the cylinder.

#### All DOT 3AL Cylinders Made of Aluminum Alloy 6351

DOT 3AL cylinders which presently contain Poison A materials, flammable gases, pyrophoric liquids or gases, liquids toxic by inhalation or highly toxic gases other than Poison A should be stored in well ventilated areas. Additionally, DOT 3AL cylinders containing oxygen, if stored or used in confined spaces, should be checked for leakage to prevent the possibility of an oxygen enriched environment.

Each person possessing a leaking DOT 3AL cylinder which contains a Poison A material, a flammable gas, a pyrophoric liquid or gas, liquids toxic by inhalation or a toxic gas other than Poison A, should contact the material supplier (the name and address of the supplier is found on the shoulder decal of the cylinder) or the cylinder manufacturer. Leaking cylinders may not be offered for transportation.

#### Advance Notice of Proposed Rulemaking

RSPA is requesting additional information from manufacturers and users of DOT 3AL cylinders. RSPA requests that anyone having information on cracked or leaking DOT 3AL cylinders provide this information to RSPA in written form. Additionally, comments are solicited on ways to address the cracking problem in DOT 3AL cylinders and controls that may be necessary for the continued use of existing cylinders.

Issued in Washington, DC, on July 6, 1987 under authority delegated in 49 CFR Part 106, Appendix A.

Alan I. Roberts,  
Director, Office of Hazardous Materials Transportation.

#### PART 178—[AMENDED]

##### APPENDIX A—DOT 3AL CYLINDERS MADE OF HIGH LEAD ALUMINUM ALLOY 6351 WITH TAPERED THREADS

Serial No.	Cast code
ALO 11-64.....	697-898
ALO 92.....	897
SG 201-301.....	129-132
SG 303-388.....	131-133
SG 377.....	934
SG 381-382.....	934
SG 392.....	934
SG 395-396.....	933-934
SG 416.....	934
SG 421.....	934
SG 426-431.....	932-934
SG 433-449.....	931-933
SG 451-453.....	932-933
SG 455-459.....	932-933

APPENDIX A—DOT 3AL CYLINDERS MADE OF HIGH LEAD ALUMINUM ALLOY 6351 WITH TAPERED THREADS—Continued

Serial No.	Cast code
SG 431-434	932-934
SG 474	934
SG 460-462	934
SG 464	934
SG 460-467	934
SG 469	933
SG 503-510	933-934
SG 520-521	934
SG 525-526	934
SG 531-542	934
SG 534-535	934
SG 538	934
SG 544	933
SG 516-582	931-932
SG 584	831
SG 586-589	932
SG 591-594	931-932
SG 596-600	129-132/931-932
SG 622-635	129-133
SG 637-651	130-133
SG 665	931
SG 667	934
SG 689	934
SG 703	934
SG 709, 725	131-132
AL 554	932
AL 577-589	932-933
AL 591-593	933
AL 595-617	932-933
AL 619	934
AL 631-633	934
AL 634-635	934
AL 639-655	934
AL 675	934
AL 677-678	934/129
AL 681	132
AL 683	129
AL 685-686	129/132
AL 688-692	120/132
AL 698	934
AL 703	130
AL 704	934
AL 706-735	129-130
AL 738	129
AL 740-741	130
AL 743	130
AL 745	129
AL 748	130
AL 753	130
AL 756	130
AL 766	129
AL 768-772	129
AL 774-775	129
AL 860G1-860J3	897-898
AL 860L5-860L11	897-898
AL 860C3-860L8	897-898
AL 861L7	897
AL 861L11-860L15	898-899/64
LL 1142-1149	850/897
LL 1154-1177	897
LL 1270	899
LL 1287	34
LL 1290	33
LL 1294-1295	952/32
LL 1303	953
LL 1312	897
LL 1314-1315	897
LL 17930-18010	897-898
LL 18112-18015	898
LL 18118-18011	897-898
LL 18106	898
LL 18124-18160	897
LL 18172-18251	897-898/850
LL 18253-18276	897-898
LL 18280-18450	897-898/850
LL 18282-18315	897-898/850
LL 18315-18321	897-898/850
LL 18373-18378	897-898/850
LL 18380-18384	897-898
LL 18336-18350	897-898/850
LL 18352-18359	897-898/850
LL 18361-18368	897-898
LL 18453-18459	897-898/850
LL 18463-18476	897-898/850
LL 18481-18496	897-898/850
LL 18495-18503	897-898
LL 18502-18507	897-898
LL 18510-18512	898

APPENDIX A—DOT 3AL CYLINDERS MADE OF HIGH LEAD ALUMINUM ALLOY 6351 WITH TAPERED THREADS—Continued

Serial No.	Cast code
LL 18516-18587	897-898
LL 18589-18636	897-898/850
LL 18638-18639	897-898
LL 18641-18653	897-898
LL 18655-18657	897-898
LL 18757	898
LL 18760-18763	898-899
LL 18765	899
LL 18772-18773	899
LL 18775	898
LL 18787-18788	899/953
LL 18792-18793	898
LL 18811	953
LL 18818	899
LL 31845	132
IL 2038	931
IL 2041-2042	931-932
IL 2044	931
IL 2051	931
IL 2064	932
IL 2070-2071	931-932
IL 2098	932
IL 2168	932
IL 2170-2173	931
IL 2177	931
IL 2183	931
IL 2188	931
IL 2193	931
IL 2199-2199	931-932
IL 2287	931
IL 2291-2292	931
IL 2294-2295	931
IL 2297	931
IL 2300	931
IL 2307	931
IL 2614	934
IL 2629	934
IL 2633-2634	934
IL 2643	934
IL 2645-2646	120/132
IL 2650-2652	934
IL 2654	934
IL 2657-2659	934
IL 2662	934
IL 2666	934
BAL 3007	84
BAL 3023	953
BAL 3202	897
BAL 3260	953
AAL 10258-10295	931-932
AAL 10308-10313	931-932
AAL 10321-10322	931
AAL 10325	931
AAL 10340-10367	931
AAL 10369	932
AAL 10374	932
AAL 10376-10455	931-933
AAL 10463	932
AAL 10475-10476	931
AAL 10528-10567	931-933
AAL 10569-10570	932-933
AAL 10572	933
AAL 10575-10578	933
AAL 10579-10584	933
AAL 10587	933
AAL 10589-10637	932-933
AAL 10639-10691	931-933
AAL 10693-10707	932-933
AAL 10709-10807	931-933
AAL 10809-10814	933
AAL 10816-10905	931-933
AAL 10909	934
AAL 10911-10913	934
AAL 10920	934
AAL 10927-10929	934
AAL 10946	932
AAL 10966	934
AAL 10975	934
AAL 10982	934
AAL 10991	934
AAL 10993	934
AAL 11001	934
AAL 11004	934
AAL 11009	934
AAL 11019	934
AAL 11025	934
AAL 11032	934
AAL 11043	934
AAL 11045-11046	934

APPENDIX A—DOT 3AL CYLINDERS MADE OF HIGH LEAD ALUMINUM ALLOY 6351 WITH TAPERED THREADS—Continued

Serial No.	Cast code
AAL 11048-11050	934
AAL 11053-11058	934
AAL 11060-11061	934
AAL 11070	934
AAL 11072-11073	934
AAL 11076-11080	934
AAL 11082-11097	934
AAL 11100	934
AAL 11102-11113	934
AAL 11119	934
AAL 11121	934
AAL 11128-11131	934
AAL 11133	934
AAL 11135	934
AAL 11141	934
AAL 11143-11146	934
AAL 11170	934
AAL 11184	934
AAL 11187-11188	934
AAL 11190-11191	934
AAL 11193	934
AAL 11197	934
AAL 11199-11200	934
AAL 11204	934
AAL 11208-11209	934
AAL 11214	934
AAL 11217-11219	934
AAL 11220-11229	934
AAL 11255	934
AAL 11278-11280	934
AAL 11282	934
AAL 11286-11289	934
AAL 11291-11297	934
AAL 11299	934
AAL 11305	934
AAL 11308	934
AAL 11310-11314	931-934
AAL 11316-11329	932-934
AAL 11336-11337	934
AAL 11340	934
AAL 11342-11348	934
AAL 11351	934
AAL 11364-11411	129-132
AAL 11413-11420	129-130
AAL 11422-11431	129-130/854
AAL 11433	130
AAL 11435-11470	130/933
AAL 11472-11478	129-130
AAL 11480-11481	130
AAL 11483-11484	130
AAL 11486	932
AAL 11488	130
AAL 11490	130
AAL 11492	130
AAL 11494-11496	129-130
AAL 11502-11504	132/932
AAL 11506	931
AAL 11512-11515	130/931/937
AAL 11517-11541	129/133/932-933
AAL 11543-11545	129
AAL 11549-11553	129
AAL 11558-11583	129-130/132-133/934
AAL 11586-11590	934
AAL 11604-11627	129/131-133/932-933
AAL 11629-11771	125/131-153/165-172
AAL 11774	129
AAL 11750	130
AAL 11787	130
AAL 11790	129
AAL 11792	150
AAL 11795	129
AAL 11802-11881	168-172
AAL 12068-12092	168-172
AAL 12097-12099	170-171
AAL 12108-12119	168-171
SX 16567-16573	931-932
SX 16579	931
SX 16581	931
SX 16584-16587	927/931
SX 16597	931
SX 16607	931
SX 16612	931
SX 16615	932
SX 16617-16618	932
SX 16620	932

APPENDIX A—DOT 3AL CYLINDERS MADE OF  
HIGH LEAD ALUMINUM ALLOY 6351 WITH  
TAPERED THREADS—Continued

Serial No.	Cast code
SX 16623	932
SX 16627-16757	129-133/932-932
SX 16759-16841	129-133/931-932
SX 16843-16966	129-130/132/169-172/934
SX 17003	133
SX 17829	898
SX 17831	898
SX 17833-17839	897-898
SX 17841-17845	897-898
CC 30704-30705	931
CC 30708-30709	931
CC 30712-30714	931
CC 30716-30729	931-932
CC 30774-30748	931-932
CC 30750	931
CC 30752-30754	931
CC 30756-30758	931-932
CC 30969	934
CC 31003-31007	934
CC 31052-31093	933-934
CC 31040	934
CC 31048	934
CC 31051	934
CC 31054	934
CC 30158	934
CC 31062	934
CC 31066-31067	934
CC 31070-31072	934
CC 31074-31076	934
CC 31082	934
CC 31054-31090	934
CC 31002	934
CC 31103	934
CC 31107	934
CC 31124-31126	934
CC 31128-31130	934
CC 31132	934
CC 31135	934
CC 31137-31138	934
CC 31142-31144	934
CC 31146	934
CC 31180	934
CC 31182	934
CC 31186	934
CC 31712	934
CC 31715-31717	934
CC 31719	934
CC 31722-31725	933-934
CC 31727-31729	934
CC 31732-31735	934
CC 31846-31857	131-132/932/934
CC 31860-31861	933-934
CC 31863	934
CC 31865	934
CC 31921-31940	129-130/132
CC 31942-32020	129-130/132
CC 32022-32051	130-132/934
CC 32070	129
CC 32999	131
CC 32939	131
CC 35643-36667	169-171
CC 36673-36772	169-172
CC 36774-36780	169-171
CC 36782-36835	169-172
CC 36837-36840	170
CC 36842-36847	170-171
CC 36849-36922	169-171
MM 217833-217857	174/999
MM 220149-220350	262
MM 220353-220354	262
MM 220358	262
MM 220362-220365	262
MM 220367-220371	261-262

[FR Doc. 87-15684 Filed 7-9-87; 8:45 am]

BILLING CODE 4910-60-M