U.S. Department
of Transportation
**Research and
Special Programs
Administration**

JUL 13 1998

400 Seventh Street, S.W.
Washington, D.C. 20590

DOT-E 10134
(SECOND REVISION)

EXPIRATION DATE: June 30, 2000

(FOR RENEWAL, SEE 49 CFR 107.109)

1. GRANTEE: Allied Signal, Inc.
Tempe, Arizona

2. PURPOSE AND LIMITATIONS:

a. This exemption authorizes the manufacture, mark, sale and use of non-DOT specification pressure vessel conforming with all regulations applicable to a DOT specification 3HT cylinder except as specified herein, for the transportation in commerce of the materials authorized by this exemption. This exemption provides no relief from any Hazardous Materials Regulation other than as specifically stated herein.

b. The safety analyses performed in development of this exemption only considered the hazards and risks associated with transportation in commerce. The safety analyses did not consider the hazards and risks associated with consumer use, use as a component of a transport vehicle or other device, or other uses not associated with transportation in commerce.

3. REGULATORY SYSTEM AFFECTED: 49 CFR Parts 106, 107 and 171-180.

4. REGULATIONS FROM WHICH EXEMPTED: 49 CFR 173.302(a), 175.3 and 178.44.

5. BASIS: This exemption is based on the application of Allied Signal dated May 15, 1998 , submitted in accordance with 49 CFR 107.109.

6. HAZARDOUS MATERIALS (49 CFR 172.101):

| Proper Shipping Name/ Hazardous Material Description | Hazard Class/ Division | Identi- fication Number | Packing Group |
|---|---|---|---|
| Compressed gases, n.o.s. | 2.2 | UN1956 | n/a |

For the N.O.S. entries above, the requirements of 49 CFR 172.,203(k) must be met.

7. SAFETY CONTROL MEASURES: Packaging prescribed is a welded non-DOT specification spherical pressure vessel, made of a titanium alloy, having a nominal water capacity of 15 cubic inches and 10,000 psig maximum service pressure. The pressure vessel must conform with A-SAC's drawing PL 59364-3252039 dated May 17, 1988 on file with the Office of Hazardous Materials Exemptions and Approvals. Additionally, the pressure vessel must conform with DOT Specification 3HT (§ 178.44), except as follows:

§ 178.44(a) Type, size and service pressure.

Welded spherical pressure vessel manufactured as shown in A-SAC's drawing PL 59364-3252039 having a nominal water capacity of 15 cubic inches with a service pressure of 10,000 pounds per square inch gauge, maximum.

§ 178.44(b) Authorized Material.

Titanium alloy conforming with AMS 4967 or MIL-T-9047, Condition A.

§ 178.44(d) Manufacture.

By best appliances and methods; dirt and scale to be removed as necessary to afford proper inspection. Two machined half shells must be welded in accordance with AMS 2680 with one girth weld.

§ 178.44(e) Welding or Brazing.

Welding as prescribed in § 178.44(a) of this exemption is authorized. All welds must be 100 percent radiographed and penetrant inspected after hydrostatic test.

§ 178.44(f) Wall thickness

(2) Calculations must be made by the formula:

$S = PD/4t$

where:

S = Wall stress in pounds per square inch gauge;
P = Minimum test pressure in pounds per square inch gauge;
D = Inside diameter in inches; and
t = Minimum wall thickness in inches.

§ 178.44(g) Heat treatment.

Each pressure vessel must be heat treated per MIL-H-81200 to obtain the mechanical properties specified in § 178.44(p) of this exemption.

§ 178.44(i) Hydrostatic test

(4) Test pressure is 17,250 psig, minimum.

§ 178.44(j) Cycling test.

(3) In this exemption, a "lot" means a group of pressure vessels successively produced having the same:

(i) size and configuration:
(ii) specified material of construction;
(iii) process of manufacture and heat treatment;
(iv) equipment of manufacture and heat treatment; and
(v) condition of time, temperature and atmosphere during heat treatment.

(4) (Added) In no case may the lot size exceed 200 pressure vessels but any pressure vessel processed for use in the required destructive testing need not be counted as being one of the 200 cylinders.

§ 178.44(l) Flattening test.

(1) One pressure vessel taken at random out of each lot of 200 spheres or less, after hydrostatic test, must be flattened at the weld between parallel steel plates at right angles to the plates. Any projecting appurtenances may be cut off (by mechanical means only) prior to flattening.

(2) Alternate test specimen consisting of a ring section cut from the pressure vessel is authorized.

§ 178.44(m) Physical test.

Applies except for the following:

Required on 2 specimens cut from one pressure vessel out of each lot or from a ring of the same thickness as the spherical pressure vessel subjected to the same heat treatment as the finished pressure vessel.

§ 178.44(n) Magnetic particle inspection.

Magnetic particle inspection is not required. Instead, each pressure vessel must be inspected using apparatus and procedures for liquid penetrant examination in accordance with ASTM E-165-65 or in accordance with MIL-STD-6866 with acceptable criteria in accordance with MIL-P-47158. Inspection shall be performed externally on the finished pressure vessel after hydrostatic test. Evidence of discontinuities, which in the opinion of the independent inspector may appreciably weaken or decrease the durability of the pressure vessel, shall be cause of rejection.

§ 178.44(p) Acceptable results of tests.

(1) Flattening required without cracking to one-half of the diameter of the sphere.

(2) Physical tests: The following minimum mechanical properties must be met:

(i) Ultimate tensile strength = 140,000 psi;
(ii) Yield strength = 125,000 psi;
(iii) Elongation at 4D size specimen = 6 % transverse, 10 % longitudinal;
(iv) Reduction in area = 20 %.

(3) Minimum burst pressure = 23,000 psig.

(4) Cycling: Test pressure vessel must withstand at least 1,000 pressurizations without evidence of distortion or failure. As an alternate, lot testing is not required if the design is qualified by cycling 3 prototype pressure vessels to 5,000 pressurizations without evidence of distortion or failure.

§ 178.44(q) Rejected pressure vessels

(1) Reheat treatment is authorized; subsequent thereto, acceptable pressure vessels must pass all prescribed tests.

(2) Repair of welds is authorized after which reheat treatment is required and; subsequent thereto, acceptable pressure vessels must pass all prescribed tests.

§ 178.44(r) Marking.

(1) Applies, except that:

(i) Instead of DOT-3HT, pressure vessels must be marked "DOT-E 10134" followed by the service pressure.

(ii) Marking by low stress type method such as electro-chemical etching, vibro-pen or laser marking, which does not decrease the integrity of the pressure vessel, is authorized.

(2) Stamping of elastic expansion is not required.

(3) Name plates. - Not required.

§ 178.44(s) Inspector's Report.

The inspector's reports must be appropriately modified to reflect compliance with this exemption.

8. SPECIAL PROVISIONS.

a. Pressure vessels are subject to the use restrictions prescribed in 49 CFR 173.302(a)(2), except that they may also be used in military weapons or defense initiatives systems. A copy of the inspector's report on the first lot required in § 178.44-25 must be submitted to the OHMT prior to initial shipment.

b. Pressure vessels must be shipped in strong outside packagings in conformance with 49 CFR 173.301(k).

c. In accordance with the provisions of Paragraph (b) of 49 CFR 173.22a, persons may use the packaging authorized by this exemption for the transportation of the hazardous materials specified in paragraph 6, only in conformance with the terms of this exemption.

d. A person who is not a holder of this exemption, but receives a package covered by this exemption, may reoffer it for transportation provided no modifications or changes are made to the package and it is offered for transportation in conformance with this exemption and the HMR.

e. A current copy of this exemption must be maintained at each facility where the package is offered or reoffered for transportation.

f. Each packaging manufactured under the authority of this exemption must be marked with a registration symbol designated by the Office of Hazardous Materials Exemptions and Approvals for a specific manufacturing facility.

g. A current copy of this exemption must be maintained at each facility where the package is manufactured under this exemption. It must be made available to a DOT representative upon request.

9. MODES OF TRANSPORTATION AUTHORIZED: Motor vehicle, rail freight, cargo vessel, cargo aircraft only, and passenger aircraft.

10. MODAL REQUIREMENTS: A copy of this exemption must be carried aboard each cargo vessel, aircraft or motor vehicle used to transport packages covered by this exemption. The shipper shall furnish a copy of this exemption to the air carrier before or at the time the shipment is tendered.

11. COMPLIANCE: Failure by a person to comply with any of the following may result in suspension or revocation of this exemption and penalties prescribed by the Federal hazardous materials transportation law, 49 U.S.C. Section 5101 et seq:

- All terms and conditions prescribed in this exemption and the Hazardous Materials Regulations, Parts 171-180.
- Registration required by 49 CFR 107.601 et seq., when applicable.

Each "Hazmat employee", as defined in 49 CFR 171.8, who performs a function subject to this exemption must receive training on the requirements and conditions of this exemption in addition to the training required by 49 CFR 172.700 through 172.704.

No person may use or apply this exemption, including display of its number, when the exemption has expired or is otherwise no longer in effect.

12. REPORTING REQUIREMENTS: The carrier is required to report any incident involving loss of packaging contents or packaging failure to the Associate Administrator for Hazardous Materials Safety (AAHMS) as soon as practicable. (49 CFR 171.15 and 171.16 apply to any activity undertaken under the authority of this exemption.) In addition, the holder(s) of this exemption must also inform the AAHMS, in writing, as soon as practicable of any incidents involving

the package and shipments made under this exemption.

Issued at Washington, D.C.

JUL 13 1998

(DATE)

Alan I. Roberts
Associate Administrator for
Hazardous Materials Safety

Address all inquiries to: Associate Administrator for Hazardous Materials Safety, Research and Special Programs Administration, Department of Transportation, Washington, D.C. 20590. Attention: DHM-31.

The original of this exemption is on file at the above office. Photo reproductions and legible reductions of this exemption are permitted. Any alteration of this exemption is prohibited.

Copies of exemptions may be obtained from the AAHMS, U.S. Department of Transportation, 400 7th Street, Washington, DC 20590-0001, Attention: Docket Section, 202-366-5046.

Dist: FHWA, FRA, USCG, FAA
PO: am