U.S. Department
of Transportation

**Research and
Special Programs
Administration**

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

DOT-E 8763
(FIRST REVISION)

JUN 2 1987

1. Liquid Air Corporation, San Francisco, California, is hereby granted an exemption from those provisions of this Department's Hazardous Materials Regulations specified in paragraph 5 below to offer packages of a flammable gas for transportation in commerce subject to the limitations and special requirements specified herein. This exemption authorizes the use of non-DOT specification cargo tanks described in paragraph 7 below, and provides no relief from any regulation other than as specifically stated.

2. BASIS. This exemption is based on Liquid Air Corporation's applications dated December 4, 1981, submitted in accordance with 49 CFR 107.103 and January 10, 1984, submitted in accordance with 49 CFR 107.105 and the public proceedings thereon and supplemental letter of November 9, 1983.

3. HAZARDOUS MATERIALS (Descriptor and class). Liquefied hydrogen, classed as a flammable gas.

4. PROPER SHIPPING NAME (49 CFR 172.101). Hydrogen, liquefied.

5. REGULATION AFFECTED. 49 CFR 173.316(a), 173.315(a).

6. MODE OF TRANSPORTATION AUTHORIZED. Motor vehicle.

7. SAFETY CONTROL MEASURES. Packaging prescribed is one non-DOT specification 10,766 gallon nominal water capacity vacuum insulated cargo tank having a design pressure of 100 psig, a stainless steel (type 304) inner tank, and a protective carbon steel outer jacket. Each tank must be constructed to meet the requirements of Section VIII of the ASME Code and must be in accordance with Cosmodyne Corporation's model FB-11 and Report CE-304R and TCC 1053 bearing serial number 1056 on file with the Office of Hazardous Materials Transportation (OHMT).

a. Tank must be filled by weight so as to allow at least two percent outage below the inlet of the safety relief valve under conditions of incipient opening of this valve with the tank in a level attitude. Maximum permitted filling densities are 6.6 percent with road relief valve set at 17 psig or 5.4 percent at 100 psig pressure relief valve setting.

b. The tank must be protected by one or more spring loaded safety relief velves and one or more frangible discs arranged to discharge upward and unobstructed to the outside to the protective housing. The rated relieving capacity for each safety relief valve and frangible disc must be as determined by the flow formulas contained in CGA Pamplet S-1.2. The minimum total capacity of the safety relief valves and the minimum capacity of the frangible discs must be as calculated using the formulas in the above pamphlet with the insulation space saturated with gaseous lading at atmospheric pressure, or on a bare tank basis. Each safety relief valve on the tank must be set to start-to-discharge at a pressure no

higher than 110 percent of the tank design pressure. The frangible discs must be designed to commence functioning at a pressure no lower than 130 percent and no higher than 150 percent of the tank design pressure. Road relief valves set at 17 psi is authorized.

c. The cargo tank must be reinspected and retested at one and one-half times the sum of the design pressure plus 14.7 plus the static head, once every 2 years in accordance with 49 CFR 173.33(d) as prescribed for DOT Specification MC-331 cargo tanks.

d. The cargo tank must be plainly marked on the right side near the front, in letters at least two inches high on a contrasting background, "DOT-E 8763" and the legend "Rated One-Way Travel Time _____Hours_____psig to_____psig at_____percent filling density." (Note: This blank must be filled in according to the results obtained from an actual test on one tank out of each design as described below. Holding time test must be determined no later than at the next scheduled test date).

e. To determine the "One-Way Travel Time" (OWTT) a measured holding time test must be performed with the tank charged with the intended commodity at the maximum loading temperature to be used in service and to a filling density for which the OWTT is being determined. The equilibrium pressures and ambient temperatures must be recorded at 3-hour intervals until the pressure level of the contents reaches a pressure not to exceed that at which the lowest pressure relieving device is set to open. This total time lapse in hours shall be noted "measured holding time at ... °F. average temperature, _____psig to _____psig at _____percent filling density." The measured holding time must be adjusted to the equivalent holding time at 85°F. to establish the rated holding time (RHT). The holding time stamped on the jacket nameplate (marked rated holding time--MRHT), may be equal to or less than the established RHT. The "One-Way Travel Time" is determined by the formula:

$$OWTT = \frac{MRHT - 24}{2}; \quad \text{If MRHT is less than 72 hours.}$$

$$OWTT = MRHT - 48; \quad \text{If MRHT is 72 hours or more.}$$

f. If the tank is to be operated under more than one filling density sufficient OWTT information must be marked on the tank to cover the range of filling desities used. For tanks equipped with a road relief valve which can be isolated from the inner tank during transportation so that only the safety relief valves are functional, a filling density not exceeding 6.6 percent may be used provided that partial unloading of a sufficient amount is made prior to switch over from road to safety relief valve. The OWTT determined at maximum fill density (based on the road relief valve setting) may be used if it can be demonstrated that this OWTT is less than the OWTT which would be indicated at a fill density of 25 percent of the

maximum allowed. An OWTT determined by testing as provided by 7.e. may be applicable to a fill density greater than or equal to the tested value for which the same relief setting is used.

g. Partial unloading at one or more locations is authorized subject to the following conditions. Each tank must be equilibrated prior to dispatch, after any unloading. Equilibration must be performed at authorized facilities only. The time lapse between dispatch or previous equilibration and subsequent equilibration must not exceed the One Way Travel Time described in paragraph 7.e. or 7.f. above.

8. SPECIAL PROVISIONS.

a. A copy of this exemption must be carried aboard each motor vehicle used to transport packages covered by this exemption.

b. Before transportation in an empty condition, each tank must be emptied of liquid contents. In addition, the vapor pressure must be so reduced as to avoid the possibility of venting en route.

c. Drivers must have been instructed as to necessary safeguards and proper procedure in the event of unusual delay, fire or accident.

d. For each shipment, the driver must record the cargo tank pressure at the start of each trip, immediately before and after any venting, at least once every five hours, and at destination point for the commodity. If the trip log record indicates that the actual holding time is less than 90 percent of the marked rated holding time (MRHT), the tank must be repaired to restore it to the MRHT value before returning it to service.

9. REPORTING REQUIREMENTS. Any incident involving loss of contents of the package must be reported to the OHMT as soon as practicable.

10. EXPIRATION DATE. April 30, 1989.

Issued at Washington, D.C.:

Donald R. Smith

JUN 2 1987

for Alan I. Roberts
Director
Office of Hazardous Materials
Transportation

(DATE)

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