



Memorandum

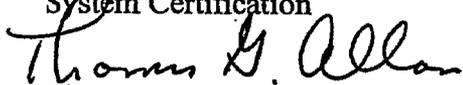
U.S. Department
of Transportation
**Research and
Special Programs
Administration**

Date: **MAR 15 2002**

Reply to Attn. of: Gorsky, x69532

Subject: Cargo Tank Emergency Discharge Control
System Certification

Ref. No. 02-0079


From: Thomas G. Allan
Senior Transportation Regulations Specialist
Office of Hazardous Materials Standards

To: William A. Quade
Chief of Hazardous Materials Division
Federal Motor Carrier Safety Administration

This responds to your request for a clarification, by e-mail dated February 14, 2002, related to cargo tank emergency discharge control requirements specified in the Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180). Specifically, you ask for a clarification of the items that must be addressed in the certification by a Design Certifying Engineer (DCE) of an emergency discharge control system for a cargo tank used to transport liquefied compressed gas.

As your email notes, the emergency discharge control requirements in § 173.315(n)(2)(ii) of the HMR require the design for a passive shut-down system (i.e., a means to automatically shut off the flow of product without the need for human intervention) to be certified by a DCE. The DCE certification must explain how the passive shut-down system operates and must indicate the parameters within which the system is designed to operate. Section 173.315(n)(2)(ii) provides some examples of what is meant by the term "parameters" – temperature, pressure, and types of product. Thus, the certification should indicate the range of temperatures within which the system is designed to operate. Further, the certification should specify whether the system's operation is dependent on the pressure inside the cargo tank during an unloading operation. If so, the certification should specify the pressure above or below which the system may not operate. In addition, the certification should indicate if the system is designed to operate irrespective of the material being transported in the cargo tank. If it is not, the certification should specify the materials for which the system is designed to function. Note that these are illustrative examples only. If there are additional operating conditions that may affect the proper functioning of the emergency discharge control system, the certification should so specify.

Based on the foregoing, it appears that the certification prepared by BASE Engineering, Inc., which you provided with your email, does not conform to the requirements in § 173.315(n)(2)(ii).

I hope this information is helpful. If you have further questions, please do not hesitate to contact this office.

#

Billings, Delmer

Gorsky
§173.315(n)(e)
Cargo Tanks
02-0079

From: Shelton, Daniel <FHWA> [Daniel.Shelton@fhwa.dot.gov]
Sent: Thursday, February 14, 2002 1:37 PM
To: Billings, Delmer <RSPA>
Cc: Swift, Danny <FHWA>; Quade, William <FHWA>; Delorenzo, Joseph <FHWA>
Subject: Request for Interpretation



Certification of passive
shutd...

Del, please find attached for your review two separate documents certifying independent passive shutdown systems which are designed to meet the requirements of 173.315(n)(2). The regulation in 173.315(n)(2)(ii) states in part that the design must be certified by a DCE and the certification must consider any specifications of the original component manufacturer and must explain how the passive means to shut off the flow of product operates. It must also outline the parameters (e.g. temperature, pressure, types of product).....

If you review the certification from Carson Engineering, it appears to meet not only the spirit of the regulations but also the intent of the regulation whereas the certification from Base Engineering, Inc. appears to fall short of the minimum requirements of the regulations and certainly falls short of the intent of the requirements.

Please provide FMCSA a clarification which will identify what minimum issues a DCE must address to satisfy the certification requirements for the passive shutdown system.

Thanks for your interest in highway safety.



D.J.'s Truck Repair, Inc.

P.O. BOX 596- 7202 HERTER IND. DR.- GODFREY, IL 62035
(618) 466-9346
FAX (618) 466-6634

DATE: 2-12-02

SENDER: DAVE JONES

TO/ATTN OF: DANNY SHELTON

CO NAME/DEPT: _____

NUMBER OF PAGES INCLUDING COVER PAGE: 5

SUBJECT: _____

MESSAGE:

MR SHELTON I HAVE SENT COPY OF BASE AND DJTS
PRODUCTS PLEASE REVIEW BOTH AND LET ME KNOW

THANK YOU
Dave Jones

HAZARDOUS MATERIALS GUIDE

§173.315

(n) *Emergency discharge control for cargo tank motor vehicles in liquefied compressed gas service.*—(1) *Required emergency discharge control equipment.* Each

cargo tank motor vehicle in liquefied compressed gas service must have an emergency discharge control capability as specified in the following table:

§173.315(n)(1)(*)	Material	Delivery service	Required emergency discharge control capability
(i)	Division 2.2 materials with no subsidiary hazard, excluding anhydrous ammonia.	All	None.
(ii)	Division 2.3 materials.	All	Paragraph (n)(2) of this section.
(iii)	Division 2.2 materials with a subsidiary hazard, Division 2.1 materials, and anhydrous ammonia.	Other than metered delivery service.	Paragraph (n)(2) of this section.
(iv)	Division 2.2 materials with a subsidiary hazard, Division 2.1 materials, and anhydrous ammonia in a cargo tank with a capacity of 13,247.5 L (3,500 water gallons) or less.	Metered delivery service.	Paragraph (n)(3) of this section.
(v)	Division 2.2 materials with a subsidiary hazard, Division 2.1 materials, and anhydrous ammonia in a cargo tank with a capacity greater than 13,247.5 L (3,500 water gallons).	Metered delivery service.	Paragraph (n)(3) of this section, and, for obstructed view deliveries where permitted by §177.840(p) of this subchapter, paragraph (n)(2) or (n)(4) of this section.

(2) *Cargo tank motor vehicles in other than metered delivery service.* A cargo tank motor vehicle in other than metered delivery service must have a means to automatically shut off the flow of product without the need for human intervention within 20 seconds of an unintentional release caused by a complete separation of a liquid delivery hose (passive shut-down capability).

(i) Designed flow of product through a bypass in the valve is acceptable when authorized by this subchapter.

(ii) The design for the means to automatically shut off product flow must be certified by a Design Certifying Engineer. The certification must consider any specifications of the original component manufacturer and must explain how the passive means to shut off the flow of product operates. It must also outline the parameters (e.g., temperature, pressure, types of product) within which the passive means to shut off the flow of product is designed to operate. All components of the discharge system that are integral to the design must be included in the certification. A copy of the design certification must be provided to the owner of the cargo tank motor vehicle on which the equipment will be installed.

(iii) Installation must be performed under the supervision of a Registered Inspector unless the equipment is installed and removed as part of regular operation (e.g., a hose). The Registered Inspector must certify that the equipment is installed and tested, if it is possible to do so without damaging the equipment, in accordance with the Design Certifying Engineer's certification. The Registered Inspector must provide the certification to the owner of the cargo tank motor vehicle.

(3) *Cargo tank motor vehicles in metered delivery service.* When required by the table in paragraph (n)(1) of this section, a cargo tank motor vehicle must have an

off-truck remote means to close the internal self-closing stop valve and shut off all motive and auxiliary power equipment upon activation by a qualified person attending the unloading of the cargo tank motor vehicle (off-truck remote shut-off). It must function reliably at a distance of 45.72 m (150 feet). The off-truck remote shut-off activation device must not be capable of reopening the internal self-closing stop valve after emergency activation.

(i) The emergency discharge control equipment must be installed under the supervision of a Registered Inspector. Each wireless transmitter/receiver must be tested to demonstrate that it will close the internal self-closing stop valve and shut off all motive and auxiliary power equipment at a distance of 91.44 m (300 feet) under optimum conditions. Emergency discharge control equipment that does not employ a wireless transmitter/receiver must be tested to demonstrate its functioning at the maximum length of the delivery hose.

(ii) The Registered Inspector must certify that the remote control equipment is installed in accordance with the original component manufacturer's specifications and is tested in accordance with paragraph (n)(3)(i) of this section. The Registered Inspector must provide the owner of the cargo tank motor vehicle with this certification.

(4) *Query systems.* When a transmitter/receiver system is used to satisfy the requirements of paragraph (n)(1)(v) of this section, it must close the internal self-closing stop valve and shut off all motive and auxiliary power equipment unless the qualified person attending the unloading operation prevents it from doing so at least once every five minutes. Testing and certification must be as specified in paragraph (n)(3) of this section.

BASE PHONE # 800-924-1010

173-139
11/01

SHAWN OR DARIEN

STEVE FELMAY



**Design Certifying Engineers (DCE)
Statement for LDS100 Transport Passive System**

BASE Engineering Inc. is registered under section 107.503 of Title 49, code of federal regulations (49 CFR) as a "Design Certifying Engineering" facility. Registration identification number CT-8500.

In accordance with United States Department of Transport HM225A requirements, BASE Engineering's "Passive" transport shut down system model LDS100 has been designed and tested by registered Design Certifying Engineers.

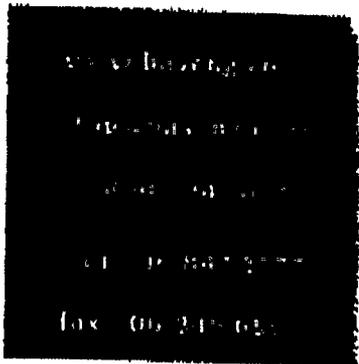
This leak detection system has been tested and verified to detect a complete hose separation and automatically generate a signal to close the tank internal valve under the following conditions:

- A minimum 2" diameter product delivery hose of 20' length is used to offload the tank trailer.
- A maximum of 8"/2" diameter piping is used between the pump and hose connection flange.
- The pump is developing a minimum of 20 PSI differential pressure and pumping liquid product.

Conditions outside of the above parameters may result in correct operation but have not been fully tested as of the date of this documentation.

Signed

Stephen A. Belyea
President



CARSON
ENGINEERINGDJT PRODUCTS 1-4
PASSIVE SYSTEM

Model 400 or Model 500

P.O. Box 2969 • Renton, WA 98056 • (206) 235-7551 • FAX (206) 277-5780 • E-MAIL - carengr@nwrain.com
PROPANE CARGO TANK UNLOADING SYSTEM CERTIFICATION**(A) Summary**

This document is the Design Certifying Engineering certification for the means to design and provide a passive shutdown for the propane cargo tank (MC330/331 Transport) unloading system. This system shall shut down within twenty seconds of an unintentional product transfer hose complete separation as required by the US Department of Transportation regulation in Title 49 CFR 173.315 (n) (2), published on May 24, 1999 (64FR28029).

(B) Description of the Propane Cargo Tank Unloading System

The propane cargo tank unloading system consists of a closed process containing liquid and gaseous propane. The process consists of the following components:

Component for primary containment

- a) A 4-inch flanged internal valve attached to the bottom of a cargo tank.
- b) A 4-inch product transfer pump with 2-inch threaded outlet (Corken Model Z4200 Pump or equivalent) with a differential relief valve setting not to exceed 100 PSIG.
- c) The combine restriction due to the combination of fittings and pipe shall not exceed an equivalent of 20 linear feet of 2-inch schedule 80 pipe. Twenty feet of 2-inch pipe is equal to 38-inch long 2-inch schedule 80 IPS pipe, a 2-inch thread pipe tee class 3000 (flow in branch) and a 2-inch medium sweep elbow class 3000.
- d) A 2-inch full port ball (isolation) valve with a flow coefficient of 165 or larger.
- e) A sensing point at discharge end of item "d" connects to a Line Break Detector with a 1/4" minimum ID tube hose or pipe to the sensing point. On transports with two discharge hose port connections, a three-way valve selects the sensing point on either the right or the left side of the cargo tank.
- f) A 2-inch male threaded pipe to 3 1/4-inch male ACME adapter
- g) A 3 1/4-inch female to 2-inch male threaded pipe adapter
- h) A 2-inch Class 3000 threaded coupling
- i) A 2-inch male threaded pipe to 2-inch crimped ID hose adapter
- j) A 2-inch OD transfer hose 40-foot long or less.

Components for emergency shutoff valves

- a) Line Break Detector (DJT Products Inc. Model 400 or 500)
- b) Spring applied mechanical actuator(s) that automatically close all open product valves on the cargo tank when air pressure is vented from attached mechanical actuator.
- c) Emergency Shutoff cables connecting the actuator to internal valves on cargo tank, if needed.

(C) Certification

Carson Engineering (CE) has reviewed technical information and equipment specification and performed flow calculations pertaining to normal transfer rates and rates of discharge if a hose were to completely separate. CE has modeled the equilibrium flow rate during a hose separation (failure) and has determined that the drop in hose pressure from a normal transfer to failure conditions is such that the DJT Product Inc.'s LBD Model 400 or 500 can sense and initiate emergency shutoff valve operation. The system described above will meet the design requirements of Title 49 CFR 173.315 (n)(2), if conditions and criteria described below are insured.

- 1) The temperature of the saturated propane is between -20°F and 120°F.
- 2) The product transfer pump shall not exceed 850-RPM nominal shaft speed.
- 3) The actuator and cables are in good condition, the cable tension is such that the internal valves on the cargo tank will actuate, and the spring to close the actuator is functional. A visual inspection of the cables and actuator test is required before transfer is started.
- 4) The tubing connecting the sensing point and LBD attaches between the isolation valve (item d) and product transfer hose with no major obstruction between sensing point and hose.
- 5) Properly maintained air system free of significant moisture, and properly lubricated.

As a Design Certifying Engineer registered with the U.S. Department of Transportation, I certify the above true and correct.

Signed:

William D. Carson DOT Certification ID #CT8083



EXPIRES 9/15/01

**CARSON
ENGINEERING**

DJT Products Model 500 only.
PASSIVE SYSTEM

P.O. Box 2969 • Renton, WA 98056 • (206) 235-7551 • FAX (206) 277-5780 • E-MAIL - carengr@nwrain.com

ANHYDROUS AMMONIA CARGO TANK UNLOADING SYSTEM CERTIFICATION *

(A) Summary

This document is the Design Certifying Engineering certification for the means to design and provide a passive shutdown for the anhydrous ammonia cargo tank (MC330/331 Transport) unloading system. This system shall shut down within twenty seconds of an unintentional product transfer hose complete separation as required by the US Department of Transportation regulation in Title 49 CFR 173.315 (n) (2), published on May 24, 1999 (64FR28029).

(B) Description of the Anhydrous Ammonia Cargo Tank Unloading System

The anhydrous ammonia cargo tank unloading system consists of a closed process containing liquid and gaseous anhydrous ammonia. The process consists of the following components:

Component for primary containment

- a) A 4-inch flanged internal valve attached to the bottom of a cargo tank.
- b) A 4-inch product transfer pump with 2-inch threaded outlet (Corken Model Z4200 Pump or equivalent) with a differential relief valve setting not to exceed 100 PSIG.
- c) The combine restriction due to the combination of fittings and pipe shall not exceed an equivalent of 20 linear feet of 2-inch schedule 80 pipe. Twenty feet of 2-inch pipe is equal to 35-inch long 2-inch schedule 80 IPS pipe, a 2-inch thread pipe tee class 3000 (flow in branch) and a 2-inch medium sweep elbow class 3000.
- d) A 2-inch full port ball (isolation) valve with a flow coefficient of 165 or larger.
- e) A sensing point at discharge end of item "d" connects to a Line Break Detector with a 1/4" minimum ID tube hose or pipe to the sensing point. On transports with two discharge hose port connections, a three-way valve selects the sensing point on either the right or the left side of the cargo tank.
- f) A 2-inch male threaded pipe to 3 1/4-inch male ACME adapter
- g) A 3 1/4-inch female to 2-inch male threaded pipe adapter
- h) A 2-inch Class 3000 threaded coupling
- i) A 2-inch male threaded pipe to 2-inch crimped ID hose adapter
- j) A 2-inch OD transfer hose 40-foot long or less.

Components for emergency shutoff valves

- a) Line Break Detector (DJT Products Inc. Model 500)
- b) Spring applied mechanical actuator(s) that automatically close all open product valves on the cargo tank when air pressure is vented from attached mechanical actuator.
- c) Emergency Shutoff cables connecting the actuator to internal valves on cargo tank, if needed.

(C) Certification

Carson Engineering (CE) has reviewed technical information and equipment specification and performed flow calculations pertaining to normal transfer rates and rates of discharge if a hose were to completely separate. CE has modeled the equilibrium flow rate during a hose separation (failure) and has determined that the drop in hose pressure from a normal transfer to failure conditions is such that the DJT Product Inc.'s LBD Model 500 can sense and initiate emergency shutoff valve operation. The system described above will meet the design requirements of Title 49 CFR 173.315 (n)(2), if conditions and criteria described below are insured.

- 1) The temperature of the saturated anhydrous ammonia is between -20°F and 120°F.
- 2) The product transfer pump shall not exceed 850-RPM nominal shaft speed.
- 3) The actuator and cables are in good condition, the cable tension is such that the internal valves on the cargo tank will actuate, and the spring to close the actuator is functional. A visual inspection of the cables and actuator test is required before transfer is started.
- 4) The tubing connecting the sensing point and LBD attaches between the isolation valve (item d) and product transfer hose with no major obstruction between sensing point and hose.
- 5) Properly maintained air system free of significant moisture, and properly lubricated.

As a Design Certifying Engineer registered with the U.S. Department of Transportation, I certify the above true and correct.

Signed:

William D. Carson

DOT Certification ID #CT8063



EXPIRES 9/15/01