

Safety Library Publication

23

Recommendations for the Transportation of Explosives, Division 1.5, Ammonium Nitrate Emulsions, Division 5.1, Combustible Liquids, Class 3, and Corrosives, Class 8 in Bulk Packaging





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IME is a nonprofit association founded in 1913 to provide accurate information and comprehensive recommendations concerning the safety and security of commercial explosive materials. IME represents U.S. manufacturers and distributors of commercial explosive materials and oxidizers as well as other companies that provide related services. Although our member companies are based in North America, IME members operate globally with operations and distribution points on all continents except Antarctica.

IME was created to provide technically accurate information and recommendations concerning commercial explosive materials and to serve as a source of reliable data about their use. Committees of qualified representatives from IME member companies developed this information and a significant number of their recommendations are embodied in the regulations of state and federal agencies.

The Institute's principal committees are: Safety, Health, and Environmental Affairs; Government Affairs; Legal Affairs; Technical; Oil and Gas; and Transportation, Distribution, and Security.

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SLP-23
Recommendations for the Transportation of Explosives, Division 1.5; Ammonium Nitrate Emulsions, Division 5.1; and Combustible Liquids in Bulk Packaging

FOREWORD

Historical data indicates that certain explosives and ammonium nitrate emulsions¹ classified as oxidizers can be safely and efficiently transported in bulk packaging by motor vehicle, vessel and rail. This bulk packaging can either be Department of Transportation (DOT) specification packaging (cargo tanks or portable tanks) or non-DOT specification bulk packaging adapted to accommodate the physical and chemical properties of the bulk explosives, oxidizers, or fuel oil transported.

The explosives authorized to be transported in bulk are tested by DOT-approved independent third-party laboratories and then submitted to and classified by the DOT Associate Administrator for Hazardous Materials Safety as *Explosives Division 1.5*.

Ammonium nitrate emulsions, classified as *Oxidizers Division 5.1*, are precursor explosives that may be transported under the provisions of this IME SLP-23.

To be approved for transportation, bulk *Explosives Division 1.5* and ammonium nitrate emulsions *Oxidizer Division 5.1*, must both pass the Vented Pipe Test as described in Appendix A of this standard.

Definitions of terms used in these standards are the same as those found in Title 49 *Code of Federal Regulations* (49 CFR), unless otherwise defined in this document.

¹ This entry applies to non-sensitized emulsions, suspensions and gels consisting primarily of a mixture of ammonium nitrate and a fuel intended to produce a Type E blasting explosive only after further processing. The mixture typically has the following composition: 60-85% ammonium nitrate; 5-30% water; 2-8% fuel; 0.5-4% emulsifier or thickening agent; 0-10% soluble flame suppressants; and trace additives. Other inorganic nitrate salts may replace part of the ammonium nitrate. These substances may not be classified and transported unless approved by the Associate Administrator for Hazardous Materials Safety.

SECTION I

STANDARDS FOR TRANSPORTING A SINGLE BULK HAZARDOUS MATERIAL FOR BLASTING BY CARGO TANK MOTOR VEHICLES

A. General

49 CFR incorporates by reference the Institute of Makers of Explosives Safety Library Publication SLP-23 for the transportation in bulk packaging of certain Class 1 and Class 5 hazardous materials that are essential to commercial blasting operations. The purpose of Section I is to set forth standards for single bulk packagings used to transport these bulk hazardous materials.

1. Bulk Hazardous Materials covered by this Section.
 - a. Explosive, Blasting, Type B *or* Agent Blasting, Type B, 1.5D, UN 0331.
 - b. Ammonium nitrate/fuel oil mixture *containing only prilled ammonium nitrate and fuel oil*, 1.5D, NA 0331.
 - c. Explosive, Blasting, Type E *or* Agent Blasting, Type E, 1.5D, UN 0332.
 - d. Ammonium nitrate emulsion *or* ammonium nitrate suspension *or* ammonium nitrate gel, *intermediate for blasting explosives*, 5.1, UN 3375.
2. Authorized Bulk Packagings for the Bulk Hazardous Materials Listed in Section I.A.1.
 - a. Explosive, Blasting type B, UN 0331, Ammonium nitrate-fuel oil mixture, NA 0331: Bulk packaging specified in 49 CFR 173.240.
 - b. Explosive, Blasting, type E, UN 0332 and Ammonium nitrate emulsion, UN 3375: Bulk packaging specified in 49 CFR 173.242.
 - c. Closed bulk packaging shall have a maximum allowable working pressure no more than 35 pounds per square inch (psi).

B. Modes of Transportation

Highway, vessel, and rail are authorized modes for the transportation of the bulk hazardous materials listed in Section I.A.1 in bulk packagings.

C. Additional Provisions

1. The bulk hazardous materials in Section I.A.1 shall pass the Vented Pipe Test as described in Appendix A.

2. Each shipment shall be limited to a single bulk hazardous material. No other hazardous material shall be transported on the cargo tank motor vehicle.
3. Each bulk packaging shall be cleaned to remove incompatible materials before it is used to transport a different bulk hazardous material.
4. The cargo compartment and all containment equipment, such as hoses, lines, pumps and valves shall be constructed of materials that are compatible with the bulk hazardous material transported.
5. All welds, joints and seams shall be fabricated to ensure containment of the bulk hazardous material during transportation. The interior surfaces of the bulk packaging shall be smooth and free of obstructions. In the event that obstructions are present, the bulk packaging shall be inspected and cleaned as may be necessary to prevent caking and/or drying-out of the bulk hazardous material.
6. The loading and unloading systems, such as pumps and augers, that are an integral part of the bulk packaging shall be free from potential sources of blockages and shall allow for the safe flow of the bulk hazardous material.
7. Transfer and unloading systems, such as pumps and augers, shall be inoperative during transportation.
8. A reclosing pressure relief valve shall be provided on all pressure-capable bulk packagings as a safety device.
9. Cargo tank outlets, valves, piping or any similar devices shall be protected from damage to prevent leakage or spillage during transport.
10. Hatches, manways and other means of access and egress shall be equipped with positive securement devices to prevent leakage or spillage during transport.
11. Bulk hazardous material shall not be allowed to remain in the bulk packaging for any period of time that could result in caking. The equipment shall be cleaned as needed to minimize the accumulation and crystallization of the bulk hazardous material in the bulk packaging.

D. Qualifications, Maintenance and Repair of Packagings

1. Manufacturers, assemblers, repairers, testers and design certifying engineers of pressure capable non-DOT specification cargo tanks or cargo tank motor vehicles shall be registered as required by 49 CFR Part 107, Subpart F.
2. Non-DOT specification cargo tanks, portable tanks, sift-proof closed vehicles and closed bulk bins that are pressure capable shall be qualified, maintained and repaired in accordance with the provisions set forth in Appendix B of this standard.

E. Qualifications of Individuals Certifying Pressure Capable Non-DOT Specification Bulk Packaging

1. It shall be the motor carrier's responsibility to ensure that individuals performing the inspections and tests set forth in Appendix B of this standard are qualified as follows:
 - a. Familiar with the bulk hazardous materials and the hazards involved when inspecting or testing the packagings for compliance.
 - b. Knowledgeable of the methods, procedures, tools and equipment used to perform the inspections or tests.
 - c. Capable of performing the inspections or tests by reason of experience, training, or both as follows:
 - 1) Successful completion of a training program which qualified the person to perform inspections and tests on bulk packagings consisting of cargo tanks, portable tanks, bulk bins and closed body bulk hoppers; or
 - 2) Possesses experience totaling at least three years:
 - i. as a mechanic or inspector in a cargo tank maintenance shop; or
 - ii. in a bulk packaging manufacturing facility.
2. Documentation of the individual's qualifications shall be:
 - a. Retained by the motor carrier for the period during which the individual is performing bulk packaging inspections and tests for the motor carrier and for one year thereafter.
 - b. On file at the motor carrier's principal place of business or at the location where the inspections or tests are made.

F. Placarding and Marking

1. Motor vehicles, cargo tanks, portable tanks and other approved bulk packagings shall be marked and placarded in accordance with 49 CFR §172, Subparts D and F.
2. Each bulk packaging authorized by this standard shall be plainly marked on its head or near the specification plate in English, "IME SLP-23" with letters and numbers at least 5 cm (2 inches) high on a contrasting background.
3. Additional markings for pressure capable non-specification bulk packagings:

- a. The manufacturer of non-DOT specification cargo tanks, portable tanks, sift-proof closed vehicles and closed bulk bins shall certify that each packaging is designed, constructed and tested in accordance with the applicable standards of IME SLP-23.
- b. The non-DOT specification bulk packagings shall be marked with a corrosion resistant metal nameplate. The nameplate shall be permanently located:
 - 1) Near the front on cargo tanks, or closed sift-proof bins; or
 - 2) Near the discharge valve on portable tanks and portable closed bulk bins.
- c. The nameplate shall be visible for inspection.
- d. The nameplate shall include the following:
 - 1. Designed for liquid____ or solid ____
 - 2. Date of manufacture _____
 - 3. Name and address of manufacturer
 - 4. Materials of construction
 - i. type of material
 - 5. Maximum allowable working pressure
 - 6. Maximum design pressure
 - 7. Maximum lading temperature
 - 8. Capacity in gallons or pounds
 - 9. Maximum weight of lading in pounds

G. Security and Safety of the bulk hazardous materials transported under the provisions of IME SLP-23

- 1. Security.
 - a. All hatches, fill openings, and manways shall be locked with a padlock to prevent unauthorized entry. All hinges and hasps shall be installed so that they cannot be removed when the openings are locked.
 - b. All auger outlet openings shall be covered and secured with tool removable devices or locks.
 - c. All product hoses, hose openings or hose storage areas shall be closed and secured with tool removable devices or locks.
 - d. All surge hoppers shall be covered and secured with tool removable devices or locks.
 - e. All augers containing Division 1.5 or 5.1 bulk hazardous materials shall be cleaned, leaving residue only, unless the augers are an integral part of the packaging.

- f. All hoses containing Division 1.5 or 5.1 bulk hazardous materials shall be blown clean, leaving residue only.
- g. No spillage of bulk hazardous materials shall be evident anywhere on the vehicle.
- h. The vehicle steering wheel shall be locked when unattended.
- i. When unattended the vehicle cab shall be locked.

2. Safety.

- a. Drivers. In addition to meeting all of the requirements set forth in the Hazardous Materials Regulations and the Federal Motor Carrier Safety Regulations, drivers of cargo tank motor vehicles transporting the bulk hazardous materials listed in Section I.A.1 shall meet the following requirements:

- 1. New cargo tank motor vehicle drivers:

- i. shall have their driving records reviewed by the motor carrier and shall not be eligible to operate a cargo tank motor vehicle under the provisions of Section I if they have –
 - 1. had any preventable accidents (as defined in 49 CFR § 385.3) in the previous 12 months; or
 - 2. been convicted of a moving violation that resulted in the loss of driving privileges in the previous 36 months;
- ii. shall be trained by the motor carrier on the handling characteristics of a cargo tank motor vehicle similar to the one to be operated; and
- iii. shall successfully complete a road test in a cargo tank motor vehicle similar to the one to be operated.

- 2. All drivers shall be instructed by the motor carrier as to the necessary safeguards and proper procedures in the event of an unusual transportation delay, accident, fire, or explosion involving the bulk hazardous materials listed in Section I.A.1.
- 3. Drivers of cargo tank motor vehicles, if involved in a preventable accident (as defined in 49 CFR § 385.3) and if retained by the motor carrier, shall be retrained. The retraining shall be successfully completed and documented prior to the first dispatch after the preventable accident.

- b. Driver qualification and training program monitoring.

1. Motor carriers shall monitor their programs to validate the qualifications and training of the drivers who operate the cargo tank motor vehicles authorized under the provisions of IME SLP-23. The monitoring procedure shall ensure that each driver –
 - i. holds a Commercial Driver's License and appropriate endorsements, as required by 49 CFR Part 383;
 - ii. meets the driver qualification requirements in 49 CFR Part 391;
 - iii. has received current training as required by 49 CFR Part 172, Subpart H, and 49 CFR §§177.800 and 177.816; and
 - iv. has received emergency response training including information necessary to communicate to responders in the event of an incident.
2. Training records shall be maintained as required by 49 CFR Part 172, Subpart H.
3. The monitoring procedure method shall be maintained for viewing if requested during a compliance inspection.
- c. Vehicle inspections audits. A motor carrier shall perform an annual audit of its safety program for cargo tank motor vehicle inspection, maintenance and repair to ensure that the requirements for daily and periodic cargo tank motor vehicle inspections set forth in 49 CFR Part 396 are properly performed and recorded. A record of the audit shall be maintained for a minimum of one year or until the next annual audit.

SECTION II

STANDARDS FOR CARGO TANK MOTOR VEHICLES CAPABLE OF TRANSPORTING MULTIPLE HAZARDOUS MATERIALS FOR BLASTING IN BULK AND NON-BULK PACKAGING

A. Purpose and Limitation

3. This section covers Divisions 1.1B, 1.1D, 1.4B, 1.4D, 1.4S and 1.5D Explosives, Division 5.1 Oxidizers, Class 8 Corrosives and Combustible liquids.

B. Hazardous Materials Covered under Section II

Proper shipping name	Hazard Class or Division	Identification Number	Packing Group
Acetic acid solution, not less than 50 percent but not more than 80 percent, by mass	8	UN2790	II
Acetic acid solution, not less than 10 percent but not more than 50 percent, by mass	8	UN2790	III
Ammonium nitrate	5.1	UN1942	III
Ammonium nitrate based fertilizer	5.1	UN2067	III
Ammonium nitrate emulsion <i>or</i> Ammonium nitrate suspension <i>or</i> Ammonium nitrate gel, <i>intermediate for blasting</i>	5.1	UN3375	II
Ammonium nitrate-fuel oil mixture containing <i>only prilled ammonium nitrate and fuel oil</i>	1.5D	NA0331	II
Articles, explosive, n.o.s.	1.4S	UN0349	II
Boosters, <i>without detonator</i>	1.1D	UN0042	II
Combustible liquid, n.o.s.	Combustible	NA1993	III
Cord, detonating, <i>flexible</i>	1.1D	UN0065	II
Cord, detonating, <i>flexible</i>	1.4D	UN0289	II
Corrosive liquid, acidic, organic, n.o.s.	8	UN3265	II
Detonators, nonelectric, <i>for blasting</i>	1.4S 1.4B	UN0455 UN0267	II
Detonator assemblies, non-electric, <i>for blasting</i>	1.4B 1.4S	UN0361 UN0500	II II
Detonators, electric, <i>for blasting</i>	1.1B ² 1.4B 1.4S	UN0030 UN0255 UN0456	II II II
Explosive, blasting, Type A	1.1D	UN0081	II
Explosive, blasting, Type B or Agent Blasting, Type B	1.5D	UN0331	II
Explosive, blasting, Type E	1.1D	UN0241	II
Explosive, blasting, Type E or Agent Blasting,			II

² Limited to detonators that contain no more than one (1) gram of explosive (excluding ignition and delay charges) and with leg wires four ft. (1.25 m) or longer.

Type E	1.5D	UN0332	
Ammonium nitrate, liquid (<i>hot concentrated solution</i>)	5.1	UN2426	N/A
Oxidizing liquid, n.o.s. *	5.1	UN3139	II, III
Oxidizing liquid, toxic, n.o.s. *	5.1, 6.1	UN3099	I, II, III
Oxidizing solid, n.o.s. *	5.1	UN1479	III
Nitrites, inorganic, aqueous solution, n.o.s	5.1	UN3219	II
Hypochlorite solutions	8	UN1791	II

* These oxidizing substances may not meet the definition for UN3375 ammonium nitrate emulsions, suspension or gels as given in 49 CFR § 172.102(c) Special Provision 147.

C. Packagings

1. Packagings are prescribed as follows:

a. Class 8 and Class 5 hazardous materials in non-bulk packaging:

1. These materials shall be separately packaged in a minimum 1/8 inch thick stainless steel or an equivalent non-DOT specification packaging permanently mounted on the cargo tank motor vehicle.
2. The packaging may not have a common wall with other compartments or tanks.

b. Division 1.5, UN0332 bulk Blasting Agent and Division 5.1, ammonium nitrate emulsions UN3375, or Oxidizer UN3139:

1. DOT 406, DOT 407, DOT 412, MC 306, MC 307 and MC 312 cargo tank motor vehicles.
2. DOT Specification IM-102 portable tanks and DOT Specification IM-101 portable tanks equipped with relief devices specified for IM-102 portable tanks so that the effective maximum allowable working pressure of the tank will not exceed 1.75 bars (25.4 psig).
3. Non-DOT specification compartmented or non-compartmented cargo tanks suitable for transportation of liquids. All non-DOT specification cargo tanks shall be equipped with pressure relief systems meeting the requirements of 49 CFR §§178.346-3 or 178.347-4.

c. Combustible liquids (NA1993):

1. DOT Specification cargo tanks, non-DOT specification cargo tanks, or non-pressure capable tanks suitable for liquids (fuel oil) having a capacity not to exceed 350 gallons.

d. Division 1.1D and 1.4D, 1.5D, and 1.4S explosives in non-bulk packaging:

1. Packaged as prescribed in the 49 CFR §173.62(c) Table according to their UN number and overpacked in an IME SLP 22 container or compartment.
- e. Division 1.1B, 1.4B and 1.4S electric or non-electric detonators, and/or detonator assemblies, and Division 1.4S Articles explosives, n.o.s.:
 1. Packaged according to 49 CFR §173.63(f) or (g) in a separate IME SLP 22 container or compartment.
- f. Division 1.5 Ammonium nitrate-fuel oil mixture, NA0331 as well as Division 5.1 Ammonium nitrate, UN1942, Ammonium nitrate based fertilizer, UN2067 and Oxidizing solid, n.o.s., UN1479 in bulk packaging authorized by 49 CFR §173.240.
2. Testing:
 - a. All DOT specification cargo tanks shall be tested and inspected as specified in 49 CFR Part 180, Subparts D, E or G as appropriate.
 - b. All non-DOT specification cargo tanks shall be tested and inspected in accordance with Appendix B.

D. Operational Controls

1. Transportation is limited to private carriage by company owned or leased vehicles, private carriage by wholly-owned subsidiary companies, or contract carriers specifically identified to, and acknowledged in writing by the Division of Approvals and Permits prior to first shipment.
2. IME SLP 22 containers or compartments:
 - a. Shall be located –
 - 1) behind the cab entirely within the profile of the cargo tank motor vehicle, forward of the rear most axle, and may not be located on the front of the cargo tank motor vehicle; or
 - 2) when transporting Division 1.1B, 1.4B and 1.4S electric or non-electric detonators and/or detonator assemblies, and Division 1.4S Articles, explosives, n.o.s., on the opposite sides of the cargo tank motor vehicle from the IME SLP 22 containers or compartments which are transporting Division 1.1D, 1.4D and 1.5D packaged explosives.
 - b. All containers shall be secured with padlocks to prevent unauthorized entry.
3. None of the hazardous materials in any cargo tank or container on the cargo tank motor vehicle may be mixed, transferred or circulated while in transit on a public highway.
4. The discharge valve for all tanks containing liquid or emulsion shall be closed during transportation.

5. Augers that are an integral part of the bulk packagings identified in Section II. D.1 may remain full of hazardous material while in transportation on public road or highway.
6. NA1993 hazardous materials that are contained in process lines or pumps may be transported on public road or highway.
7. UN3375, UN3139 and UN0332 hazardous materials that are contained in process lines and pumps that are included in a DOT specification cargo tank Leakage Test, may be transported on public highway, provided that pumps and lines are readily identifiable with a stainless-steel tag attached to the pump indicating the inspector and date that the pumps and lines were included in the Leakage Test.
8. All other process lines, discharge lines, chutes, surge hoppers, pumps or augers should be appropriately cleaned to the extent practicable to minimize residue prior to transport on public highways.
8. Drivers. In addition to meeting all the requirements set forth in the Hazardous Materials Regulations and the Federal Motor Carrier Safety Regulations, drivers of cargo tank motor vehicles transporting the bulk hazardous materials listed in Section II.B. shall meet the following requirements:
 - a. New cargo tank motor vehicle drivers –
 - 1) shall have their driving records reviewed by the motor carrier and shall not be eligible to operate a cargo tank motor vehicle under the provisions of Section II if they have –
 - i. had any preventable accidents (as defined in 49 CFR § 385.3) in the previous 12 months; or
 - ii. been convicted of a moving violation that resulted in the loss of driving privileges in the previous 36 months.
 - 2) shall be trained by the motor carrier on the handling characteristics of a cargo tank motor vehicle similar to the one to be operated; and
 - 3) shall successfully complete a road test in a cargo tank motor vehicle similar to the one to be operated.
 - b. All drivers shall be instructed by the motor carrier as to the necessary safeguards and proper procedures in the event of an unusual transportation delay, fire, explosion or accident involving the bulk hazardous materials listed in Section II.B.
 - c. Drivers of cargo tank motor vehicles, if involved in a preventable accident (as defined in 49 CFR § 385.3) and if retained by the motor carrier, shall be retrained. The retraining shall be successfully completed and documented prior to the first dispatch

after the preventable accident.

10. Driver qualification and training program monitoring.

- a. Motor carriers shall monitor their programs to validate the qualifications and training of the drivers who operate the cargo tank motor vehicles authorized under the provisions of IME SLP-23. The monitoring procedure shall ensure that each driver –
 - 1) holds a Commercial Driver's License and appropriate endorsements, as required by 49 CFR Part 383;
 - 2) meets the driver qualification requirements in 49 CFR Part 391;
 - 3) has received current training as required by 49 CFR Part 172, Subpart H, and 49 CFR §§177.800 and 177.816; and
 - 4) has received emergency response training including information necessary to communicate to responders in the event of an incident.
- b. Training records shall be maintained as required by 49 CFR Part 172, Subpart H.
- c. The monitoring procedure method shall be maintained for viewing if requested during a compliance inspection.

11. Vehicle inspections. A motor carrier shall perform an annual audit of its safety program for cargo tank motor vehicle inspection, maintenance and repair to ensure that the requirements for daily and periodic cargo tank motor vehicle inspections set forth in 49 CFR Part 396 are properly performed and recorded. A record of the audit shall be maintained for a minimum of one year or until the next annual audit.

12. Tire standards.

- a. A motor carrier shall ensure that all tires installed on a cargo tank motor vehicle operated under Section II are rated and sized according to the tire manufacturer's recommendations for size and gross vehicle weight rating, as displayed on the sidewall of the tire.
- b. Tires that are more than six years old, based on the manufacturer's date marked on the sidewall of the tire, may not be used on a motor vehicle operating under Section II.
- c. Tires on the steering axle(s) shall have a minimum tread depth of 8/32 inch and shall not be retreaded. All other tires on the cargo tank motor vehicle shall have a minimum tread depth of 4/32 inch.
- d. Prior to traveling on a public highway, tires shall be inspected to ensure they conform to requirements in the North American Standards of the Commercial Vehicle Safety Alliance (CVSA). However, tread depth shall meet the minimum requirements of Section II.D.12.c above. Tires that meet the CVSA out-of-service criteria shall be replaced prior to the vehicle being used on a public highway.

- e. Flat, leaking, or improperly inflated tires shall be repaired, replaced, or properly inflated before the cargo tank motor vehicle is driven or at the nearest safe location.

13. Emergency disconnect standards.

- a. Emergency battery disconnect. Each cargo tank motor vehicle operating under the terms of Section II shall be equipped with an emergency battery disconnect switch that can isolate the battery from the vehicle electrical system.
 - 1. The switch shall be located no more than 60 cm (24 inches) from the battery terminal.
 - 2. Each switch shall be tested once per calendar month and, in the event of malfunction or failure, be repaired or replaced prior to placing the vehicle back in service.
 - 3. The switch shall be clearly marked, "Emergency Battery Disconnect."
- b. Emergency engine shutoff. The device used to shut off the cargo tank motor vehicle engine may be the same device as in Section II.D.13.a or it may be a separate device, such as the ignition switch or a fuel cut-off valve that, when actuated, will stop the cargo tank motor vehicle engine.
 - 1. Each emergency engine shutoff device shall be tested once per calendar month and, in the event of malfunction or failure, be repaired or replaced prior to placing the cargo tank motor vehicle back in service.
 - 2. The emergency engine shutoff shall be clearly marked, "Emergency Engine Shutoff."
- c. Compliance Dates.
 - 1. All cargo tank motor vehicles operating under this section of the standard that are manufactured after [90 days post DOT approval of IME SLP-23] shall comply with the standards set forth in Section II.D.13.a and b.
 - 2. By [12 months post DOT approval of IME SLP-23], all cargo tank motor vehicles operating under this section of the standard shall comply with the standards set forth in Section II.D.13.a and b.

14. Battery location standard.

- a. Batteries and housing shall be located forward of any cargo carrying compartment of the cargo tank motor vehicle, within the profile of the vehicle (usually under the cab on the driver's side), and marked in such a way as to be easily identified to emergency responders.

- b. The battery housing shall be designed to meet the requirements of 49 CFR §393.30 with the additional requirement that all cables, not just those leading to the starter motor, shall be protected and that the positive (+) battery terminal shall be covered to prevent the possibility of short circuit.

15. Fire extinguishers.

- a. Each cargo tank motor vehicle operating under this section of the standard shall be equipped with at least two (2) multi-purpose fire extinguishers having an Underwriters' Laboratories rating of 2A-10 B:C or more.
- b. Only fire extinguishers listed or approved by a nationally recognized, fire equipment testing laboratory shall be used.
- c. Fire extinguishers shall be maintained to permit visual determination of whether they are charged.
- d. Fire extinguishers shall be located where they will be accessible for immediate use.
- e. Fire extinguishers shall be examined and recharged periodically in accordance with the manufacturer's recommendations.
- f. Whenever cargo tank motor vehicles are operated in extreme temperatures, the vehicles should be equipped with fire extinguishers appropriate for use in such environments.

E. Qualifications, Maintenance and Repair of Packagings

- 1. All DOT specification and pressure capable non-DOT specification cargo tanks used for the transport of bulk hazardous materials identified in Section II shall comply with all the requirements of Section I.D and E.
- 2. Non-DOT specification cargo tanks and portable tanks used to transport Division 1.5 Explosives UN0332 or 5.1 Oxidizers UN3375 and UN3139 shall be qualified, maintained and repaired in accordance with the provisions set forth in Appendix B of this standard.

F. Special Provisions

- 1. Cargo tank marking.
 - a. The cargo tank of the motor vehicle shall be plainly and durably marked on both sides behind the cab in letters and numbers at least 5 cm (2 inches) high on a contrasting background "IME SLP-23".
 - b. Cargo tank testing markings for non-spec tanks should be in accordance with Appendix B.

2. Additional markings for non-specification bulk packagings used to transport Division 1.5 Explosives UN0332 or 5.1 Oxidizers UN3375 and UN3139 shall be the same as those specified in Section I.F.3.
3. Placarding.
 - a. All cargo tank motor vehicles shall be multi-placarded as required by 49 CFR Part 172, Subpart F.
 - b. All bulk packages of Class 1 Explosives, Oxidizer Division 5.1, Class 8 and Combustible liquids shall be marked with ID Numbers as required by 49 CFR Part 172, Subpart D
 - c. All non-bulk packages of Class 8 Corrosives and Division 5.1 Oxidizers shall be marked and labeled as required by 49 CFR Part 172, Subparts D and E.
4. Highway, vessel, and rail are authorized modes for the transport of the hazardous materials listed in Section II in cargo tank motor vehicles.

G. Emergency Response, Reporting and Training

1. A motor carrier shall instruct its cargo tank motor vehicle drivers in the necessary safeguards and proper procedures in the event of an unusual delay, suspicious activity, fire, accident, or explosion involving the hazardous materials covered by this section of the standard.
2. In the event of an accident for which an incident report is required under 49 CFR §§ 171.15 or 171.16:
 - a. Certain incidents defined in 49 CFR 171.15 require notification to the National Response Center by phone or online as soon as practical but no later than 12 hours.
 - b. Incidents defined in 49 CFR 171.16 must be reported to DOT within 30 days on DOT form F 5800.1 Hazardous Materials Incident Report.

APPENDIX A

A. Vented Pipe Test

1. Apparatus and materials

The following items are needed:

- a. A steel pipe 31 ± 1 cm diameter and 61 ± 1 cm long, welded closed at the bottom with a 38 cm square, 10 ± 0.5 mm thick mild steel plate. The top of the pipe is welded to a 38 cm square, 10 ± 0.5 mm thick mild steel plate that contains a 78 mm diameter vent hole centrally located in the plate to which a 152 mm long steel pipe nipple of 78 mm internal diameter is welded. (See figure 1);
- b. A metal grid to support the filled pipe above the fuel and allow adequate heating. If a wooden crib fire is used, the grid should be 1.0 m above the ground, and if a liquid hydrocarbon pool fire is used then the grid shall be 0.5 m above the ground;
- c. Enough fuel to keep a fire burning for at least 30 minutes or, if necessary, until the substance has clearly had enough time to react to the fire;
- d. Suitable means of ignition to ignite the fuel from two sides e.g., for a wood fire, kerosene to soak the wood and pyrotechnic igniters with wood wool;
- e. Film or video cameras, preferably high speed and normal speed, to record events in color; and
- f. Blast gauges, radiometers and associated recording equipment may also be used.

2. Procedure

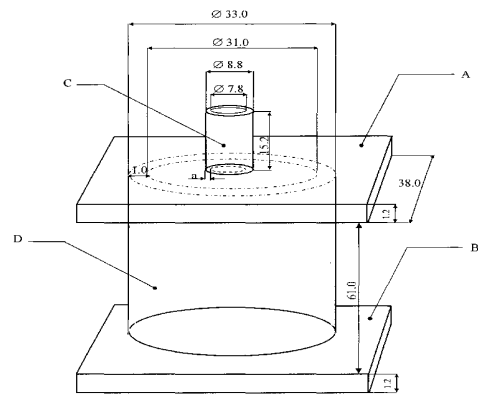
- a. The pipe is filled with the substance under test without tamping during loading. The substance is carefully packed to prevent adding voids. The steel pipe is placed vertically on the grid and secured from tipping over. Fuel is placed beneath the grid so that the fire will engulf the pipe. Precautions against side winds may be required to avoid dissipation of the heat. Suitable methods of heating include a wood fire using a lattice of wooden laths, a liquid or gas fuel fire that produces a flame temperature of at least 800°C .
- b. One method is to use a wood fire which has a balanced air/fuel ratio, thereby avoiding too much smoke which would obscure the events, and which burns with sufficient intensity and duration to bring the substance to a possible reaction. A suitable method involves using air-dried pieces of wood (approximately 50 mm square section), stacked to form a lattice beneath the grid (1.0 m off the ground), and up to the base of the grid supporting the pipe. The wood should extend beyond the pipe to a distance of at least 1.0 m in every direction and the lateral distance between the laths should be about 100

mm.

- c. A receptacle filled with suitable liquid fuel, a combination of both wood and liquid fuel fire may be used as an alternative to the wood fire, providing it is as severe. If a liquid pool fire is used, the receptacle should extend beyond the pipe to a distance of at least 1.0 m in every direction. The distance between the grid platform and the receptacle should be approximately 0.5 m. Before using this method, consideration should be given to whether any quenching action or adverse interaction between the substance and the liquid fuel can occur such as might bring the results into question.
- d. If gas is to be used as a fuel, the burning area must extend beyond the pipe to a distance of 1.0 m in every direction. The gas must be supplied in such a manner to ensure that the fire is evenly distributed around the pipe. The gas reservoir should be large enough to keep the fire burning for at least 30 minutes. Ignition of the gas may be accomplished either by remotely ignited pyrotechnics or by remote release of the gas adjacent to a pre-existing source of ignition.
- e. The ignition system should be put into place and the fuel ignited on two sides, one upwind, simultaneously. The test should not be performed under conditions where the wind speed exceeds 6 m/s. ***The fire shall be started from a safe place. If the pipe does not rupture, the system should be allowed to cool down before carefully dismantling the test set-up and emptying the pipe.***
- f. Observations are made on the following:
 - a. Evidence of explosion;
 - b. Loud noise; and
 - c. Projection of fragments from the fire area.

3. Test criteria and method of assessing results

The test result is considered “+” and the substance should not be transported in tanks if an explosion and/or fragmentation of the pipe is observed. If no explosion and/or fragmentation of the pipe is observed, then the result is considered “-”.



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Figure 1: Vented Pipe Test

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- A) Top plate (Schedule 40 carbon (A53 grade B))
 - B) Bottom plate (Schedule 40 carbon (A53 grade B))
 - C) Steel pipe nipple (a = 0.5 cm), Schedule 40 carbon (A53 grade B)
 - D) Steel pipe (Schedule 40 carbon (A53 grade B))
-

APPENDIX B

A. Qualification, Maintenance and Repair for Non-DOT Specification Cargo Tanks and pressure capable sift-proof closed vehicles and pressure-capable closed bulk bins

1. Periodic Qualification

- a. Non-DOT specification cargo tanks used to transport ammonium nitrate emulsions UN3375, Oxidizer UN3139, and *Explosives 1.5D UN0332*; and pressure capable sift-proof closed vehicles and pressure capable closed bulk bins used to transport *Explosives 1.5D NA 0331 or UN0331* must be retested, inspected, and maintained in accordance with these recommendations. Each of the above non-DOT specification bulk packaging must be tested and inspected as specified in the following table by an inspector meeting the qualifications in Section I.E. of this standard.

Periodic Tests and Inspections	Interval period
External Visual Inspection	
Cargo tanks, portable tanks, pressure capable closed sift-proof vehicles, pressure capable closed bulk bins	1 year
Internal Visual Inspection	
Insulated cargo tank, insulated portable tank	1 year
All cargo and portable tanks transporting lading corrosive to the tank	1 year
Pressure-capable closed sift-proof vehicles, pressure-capable closed bulk bins	1 year
All cargo and portable tanks	5 years
Leakage Test	
All bulk packagings authorized for liquids	1 year
All pressure-capable bulk packagings authorized for solids	1 year
Pressure Test (Hydrostatic or Pneumatic)	
All cargo tanks and portable tanks with a pressure rating transporting product corrosive to the tank	2 years
All other cargo tanks and portable tanks with a pressure rating	5 years
Sift-proof closed vehicles and closed bulk bins	No testing required

- b. Inspection and test results must be recorded and maintained at the motor carrier's principal place of business or at the location where the bulk packaging is maintained.

2. External Visual Inspection and Testing

Where insulation precludes external visual inspection, the bulk packaging must be given a visual internal inspection as prescribed by this standard. If the visual internal inspection is restricted by a lining or coating, cargo tanks and portable tanks must be hydrostatically or pneumatically tested as prescribed in these recommendations. The external visual inspection and testing must include as a minimum the following:

- a. The packaging exterior must be inspected for corroded or abraded areas, dents, distortions, defects in welds and any other conditions, including leakage that might render the packaging unsafe for transportation service.
- b. The piping, valves, and gaskets must be carefully inspected for corroded areas, defects, in welds, and other conditions, including leakage, which might render the packaging unsafe for transportation service.
- c. All devices for tightening manhole covers or packaging closures must be operative and there be no evidence of leakage at the manhole cover or packaging closure.
- d. All emergency devices and valves including self-closing valves, excess flow valves, and remote closure devices must be free from corrosion, distortion, erosion and any external damage that will prevent safe operation. Remote closure devices and self-closing stop valves must be functioned to demonstrate proper operation.
- e. Missing bolts, nuts, and fusible links or elements must be replaced, and loose bolts and nuts must be tightened.
- f. All markings on the packaging as required by Title 49 CFR parts 172, 178, and 180 and these recommendations must be legible.
- g. All major appurtenances and structural attachments on the packaging including, but not limited to, suspension system attachments, connecting structures, and those elements of the upper coupler (fifth wheel) assembly that can be inspected without dismantling the upper coupler assembly must be inspected for any corrosion or damage which might prevent safe operation.
- h. For bulk packagings transporting lading corrosive to the packaging, areas concealed from visual inspection, such as the upper coupler assembly or devices attaching the bulk packaging to the cargo tank motor vehicle must be inspected at least once in each two year period for corroded and abraded areas, dents, distortions, defects in welds, and any other condition that might render the packaging unsafe for transportation service. These types of devices must be removed from the packaging for this inspection.

- i. All reclosing pressure relief valves must be externally inspected for any corrosion or damage that might prevent safe operation. All reclosing pressure relief valves on packagings carrying lading corrosive to the valve must be removed from the packaging for inspection and testing. Each reclosing pressure relief valve required to be removed and tested must open at the required set pressure and reseal to a leak tight condition at 90 percent of the set-to-discharge pressure or the pressure prescribed for the applicable packaging specification.

3. Internal Visual Inspection

When the bulk packaging is not equipped with a manhole or inspection opening, the packaging shall be hydrostatically or pneumatically tested in accordance with these standards. The internal visual inspection must include as a minimum the following:

- a. The interior of the bulk packaging must be inspected for corroded and abraded areas, dents, distortions, defects in welds, cracks, and any other condition that might render the bulk packaging unsafe for transportation service.
- b. Cargo tanks and portable tanks with liners must be inspected in accordance with 49 CFR §180.407(f).
- c. Corroded or abraded areas of cargo tanks and portable tanks walls must be thickness tested. The minimum wall thickness is 90 percent of original wall thickness.

4. Leakage Tests

- a. Pressure Rated Tanks – Tests shall be performed by filling the tanks or compartments with water or the material to be transported. Leakage test pressure must not be less than 80 percent of the tank's Maximum Allowable Working Pressure (MAWP) as marked on the tank certification/nameplate plate. The pressure is to be maintained for five (5) minutes.
- b. Pressure-capable tanks and compartments (rounded tanks and compartments capable of resisting internal pressure, but not rated by the manufacturer) - Tests shall be performed by filling the tanks or compartments with water or the material to be transported and pressurized to the higher of 2 psig or 80% of the relief pressure of the required pressure relief system (paragraph 5.c). The pressure is to be maintained for at least five (5) minutes.
- c. The leakage test must include product piping with all valves and accessories in place and operative. Venting devices that discharge at less than the test pressure must be removed or disabled.

5. Pressure Tests

- a. Pressure-rated tanks and compartments (dry, bulk, pneumatic trailers) shall be tested

pneumatically or hydrostatically and tested at the test pressure indicated on the unit by the manufacturer. If no test pressure is indicated, the tank shall be tested at 1.25 times the MAWP shown on the certification/nameplate. The tank including its closures, must hold the prescribed test pressure for at least 10 minutes during which time it shall be inspected for leakage, bulging or any other defects.

- b. Pressure-capable tanks and compartments (rounded tanks and compartments capable of resisting internal pressure, but not rated by the manufacturer) shall be filled with water and pressurized to 2 psi.
- c. Non-DOT specification pressure rated or pressure-capable tanks and compartments must be equipped with a pressure relief system. Pressure relief systems shall be tested at the same time and pressure as the tanks on which they are installed.

6. Test and Inspection Markings

- a. Each bulk packaging successfully completing the above test and inspection requirements must be marked as specified in this section.
- b. Each bulk packaging must be durably and legibly marked, in English, with the date (month and year) and type of test or inspection performed. The date must be readily identifiable with the applicable test or inspection. The marking must be in letters and numbers at least 32 mm (1.25 inches) high, on the bulk packaging near the nameplate. The type of test or inspection may be abbreviated as follows: “V” for external visual inspection and test, “I” for internal visual inspection, “P” for pressure test, and “K” for leakage test. For a cargo tank motor vehicle comprised of multiple tanks, the test and inspection markings must be on each tank near the nameplate and may be marked once if all tests were completed during the same inspection month.

7. Repairs

Repair of bulk packagings is authorized, provided the repaired bulk packaging conforms to the original design type and is capable of withstanding the applicable design qualification test. Before a repaired bulk packaging is returned to service, it must be subjected to the all tests and inspections applicable to the design type. Retest and inspection date must be displayed as required by the above paragraph.

8. Modifications or Alterations

Modifications to existing non-DOT specification bulk packagings are authorized only if approved in writing by the manufacturer and the modified or altered bulk packaging is subjected to all inspections and tests applicable to the design type. The certification/nameplate must be updated to reflect the modification or alteration.

Safety Library Publications

<i>SLP Number</i>	<i>SLP Name</i>	<i>eLearning Module</i>
SLP – 1	Construction Guide for Storage Magazines	✓
SLP – 2	American Table of Distances	
SLP – 3	Suggested Code of Regulations for the Manufacture, Transportation, Storage, Sale, Possession and Use of Explosive Materials	
SLP – 4	Warning and Instructions for Consumers in Transporting, Storing, Handling and Using Explosive Materials	✓
SLP – 12	Glossary of Commercial Explosives Industry Terms	
SLP – 14	Handbook for the Transportation and Distribution of Explosive Materials	✓
SLP – 17	Safety in the Transportation, Storage, Handling and Use of Explosive Materials	✓
SLP – 20	Safety Guide for the Prevention of Radio Frequency Radiation Hazards in the Use of Commercial Electric Detonators (Blasting Caps)	
SLP – 22	Recommendations for the Safe Transportation of Detonators in a Vehicle with Certain Other Explosive Materials	
SLP – 23	Recommendations for the Transportation of Explosives, Division 1.1 Ammonium Nitrate Emulsions, Division 5.1, Combustible Liquids, Class 3, and Corrosives, Class 8 in Bulk Packaging	
SLP – 24	Recommendations for Handling 50 Metric Tons or more of Commercial Division 1.1 or 1.2 Break-Bulk and Containerized Explosive Materials in Transportation at Commercial Waterfront Facilities in the United States	
SLP – 25	Explosives Manufacturing & Processing Guideline to Safety Training	
SLP – 27	Security in Manufacturing, Transportation, Storage and Use of Commercial Explosives	✓
SLP – 28	Recommendations for Accountability and Security of Bulk Explosives and Bulk Security Sensitive Materials	✓
SLP – 29	Recommendations for the Environmental Management of Commercial Explosives	
SLP – 30	Safe Handling of Solid Ammonium Nitrate	✓
SLP – 31	Methods and Algorithms Used for Quantitative Risk Analysis	
SLP – 32	Recommendations for Safe and Secure Use, Storage, and Transportation of Commercial Explosives in Oil and Gas Operations	✓
SLP – 33	Safety Recommendations for the Manufacture of Explosives and Blasting Agents	

DESTRUCTION OF COMMERCIAL EXPLOSIVE MATERIALS

At times it may be necessary to destroy commercial explosive materials. These may consist of explosives or blasting agents from containers that have been broken during transportation or may be materials that have exceeded their recommended shelf life or are believed to be overage or are no longer needed.

Due to the many developments in explosive technology over the past few years, the appearance and characteristics of products have undergone marked changes. To be sure that you are familiar with the properties of the product that you plan to destroy, the manufacturer of that product should be consulted for the most current product information and the recommended method of disposal and/or destruction.

The member companies of the Institute of Makers of Explosives have agreed to supply advice and assistance in destroying explosives. If the manufacturer is known, seek his assistance. If the manufacturer is not known, a member company of the Institute of Makers of Explosives may provide advice or assistance.

The above policy of IME member companies relates only to commercial explosive materials. It does not include handling improvised explosive devices or bombs, military ordnance, military explosives, or homemade explosive materials.

IME member companies also cannot become involved in destroying explosive materials, which have been used for illegal purposes, are reportedly stolen property or are considered as evidence in any potential civil litigation or criminal prosecution.

About IME

IME is the trusted voice of the commercial explosives industry. Founded in 1913, the Institute has represented manufacturers, distributors and users of commercial explosives and other companies that provide related products and services to the industry.

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