

23

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**RECOMMENDATIONS FOR THE
TRANSPORTATION OF EXPLOSIVES,
DIVISION 1.5, AMMONIUM NITRATE EMULSIONS,
DIVISION 5.1, COMBUSTIBLE LIQUIDS,
CLASS 3, AND CORROSIVES,
CLASS 8 BULK PACKAGING**

EXPLOSIVES MAKE IT POSSIBLE

IME

institute of makers of explosives

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Associate Status:

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Manufacturers

Brussels, Belgium

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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: Environmental Affairs; Government Affairs, Legal Affairs; Safety and Health; Security; Technical; and Transportation and Distribution.

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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 packagings by motor vehicle, vessel and rail. These bulk packagings can either be Department of Transportation (DOT) specification packagings (cargo tanks or portable tanks) or non-DOT specification bulk packagings 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* that, are precursor explosives 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*, shall 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 currently does not include a provision 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 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 and 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

1. 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 thoroughly cleaned before it is used to transport a different bulk hazardous material.
4. The cargo compartment and all containment equipment 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 that are an integral part of the bulk packaging shall be free from potential sources of blockages and shall allow for the safe transfer of the bulk hazardous material.
7. Transfer and unloading systems shall be inoperative during transportation.
8. A reclosing pressure relief valve shall be provided on all pressure-capable bulk packagings.
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 packing of the bulk hazardous material in the bulk packaging.

D. Qualifications, Maintenance and Repair of Packagings

1. All bulk packagings used for the transport of bulk hazardous materials identified in Section I.A.1 shall comply with all the requirements of Section I.
2. Manufacturers, assemblers, repairers, testers and design certifying engineers of non-DOT specification cargo tanks or cargo tank motor vehicles shall be registered as required by 49 CFR Part 107, Subpart F.
3. Non-DOT specification cargo tanks, portable tanks, sift-proof closed vehicles and closed bulk bins shall be qualified, maintained and repaired in accordance with the provisions set forth in Appendix B of this standard.

E. Qualifications of Individuals Certifying 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 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 one padlock meeting forced entry ratings of grade 5 (ASTM F883-09). 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 hose openings 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 audits.
 - 1) Motor carriers shall annually audit 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 audit 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) Records of these audits shall be maintained for one year or until the next annual audit.
- 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

1. 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 | Packaging 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 <i>containing 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 | UN0030 | II |
| | 1.4B | UN0255 | II |
| | 1.4S | UN0456 | 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, Type E | 1.5D | UN0332 | II |
| Ammonium nitrate, liquid (<i>hot concentrated solution</i>) | 5.1 | UN2426 | N/A |
| Oxidizing liquid, n.o.s. * | 5.1 | UN3139 | 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:

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.

- 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. and 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 meeting grade 5 forced ratings (ASTM 883-09).
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.
9. 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 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 audits.

- a. Motor carriers shall annually audit 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 audit 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. Records of these audits shall be maintained for one year or until the next annual audit.

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) fire extinguishers, each with a rating of at least 4-A:40-B:C.
- 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 temperatures below 0 deg F (-17.8 deg C), dry powder fire extinguishers shall be designed for use in that environment.

E. Qualifications, Maintenance and Repair of Packagings

- 1. All DOT specification and 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. Manufacturers, assemblers, repairers, testers and design certifying engineers of non-DOT specification cargo tanks or cargo tank motor vehicle shall be registered as required by 49 CFR Part 107 Subpart F.
- 3. 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".
- 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, 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 that results in an overturn of a cargo tank motor vehicle ("accident") operated under the provisions of this section of the standard, the motor carrier shall:
 - a. Conduct an in-depth investigation to determine the cause(s) of the accident and provide a report of the investigation's findings, conclusions, and recommendations to prevent future accidents. The report shall be completed and forwarded to the Pipeline and Hazardous Materials Safety Administration (PHMSA)

- within 45 days after the date of the accident.
- b. Provide a copy of the motor carrier's insurance company investigation report, if available, and a copy of the police report to PHMSA within 15 days of the date the motor carrier receives them. If the motor carrier's insurance company investigation report is not available, and if requested by PHMSA, the motor carrier shall arrange for an independent accident reconstruction investigation to determine the root cause(s) of the accident and any other factors that might be relevant to prevent similar accidents from occurring in the future and provide to PHMSA within 60 days of request by PHMSA.

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.

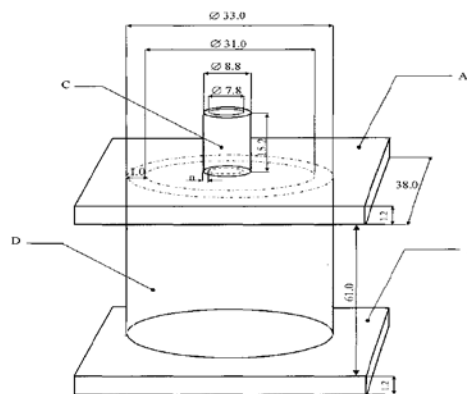
2. Procedure

- 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:
 - 1) Evidence of explosion;
 - 2) Loud noise; and
 - 3) 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 “-”.

Figure 1: Vented Pipe Test



-
- | | |
|----|--|
| 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 |

Note: Non-pressure capable packagings (sift-proof closed vehicles and closed bulk bins) are not required to be tested.

- 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 design pressure or MAWP whichever is marked on the tank certification/nameplate plate. The pressure is to be maintained for five (5) minutes.
- b. 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 filled with water 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 either 1.25 times the design pressure or 1.25 times the MAWP shown on the certification/nameplate.
- 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

| SLP Number | SLP Name | Copyright Date |
|-------------------|---|---|
| SLP – 1 | Construction Guide for Storage Magazines | September 2006 |
| SLP – 2 | American Table of Distances | June 1991 (Incorporates changes through April 2017) |
| SLP – 3 | Suggested Code of Regulations for the Manufacture, Transportation, Storage, Sale, Possession and Use of Explosive Materials | October 2015 |
| SLP – 4 | Warning and Instructions for Consumers in Transporting, Storing, Handling and Using Explosive Materials | October 2016 |
| SLP – 12 | Glossary of Commercial Explosives Industry Terms | May 2013 |
| SLP – 14 | Handbook for the Transportation and Distribution of Explosive Materials | May 2013 |
| SLP – 17 | Safety in the Transportation, Storage, Handling and Use of Explosive Materials | October 2015 |
| SLP – 20 | Safety Guide for the Prevention of Radio Frequency Radiation Hazards in the Use of Commercial Electric Detonators (Blasting Caps) | December 2011 |
| SLP – 22 | Recommendations for the Safe Transportation of Detonators in a Vehicle with Certain Other Explosive Materials | February 2007 |
| SLP – 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 | October 2011 |
| 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 | May 2011 |
| SLP – 25 | Explosives Manufacturing & Processing Guideline to Safety Training | May 2011 |
| SLP – 27 | Security in Manufacturing, Transportation, Storage and Use of Commercial Explosives | April 2012 |
| SLP – 28 | Recommendations for Accountability and Security of Bulk Explosives and Bulk Security Sensitive Materials | September 2007 |
| SLP – 29 | Recommendations for the Environmental Management of Commercial Explosives | October 2016 |
| SLP – 30 | Safe Handling of Solid Ammonium Nitrate | April 2017 |

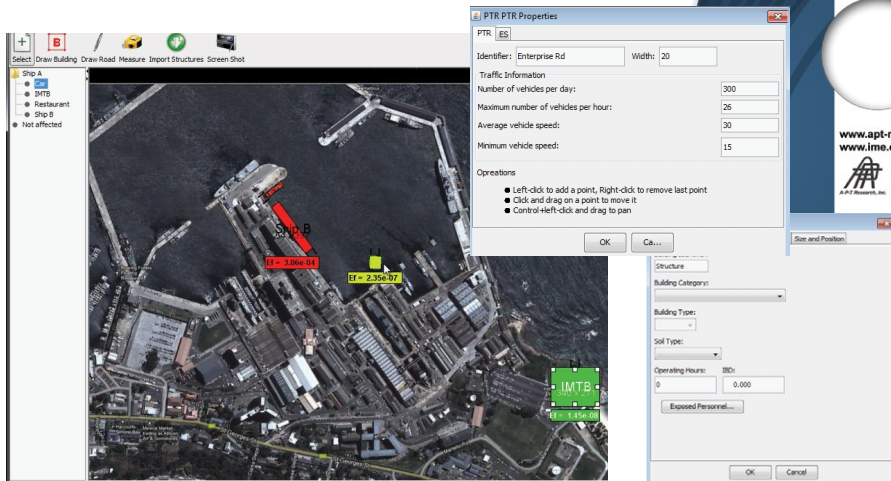
IMESAFR

Institute of Makers of Explosives Safety Analysis for Risk

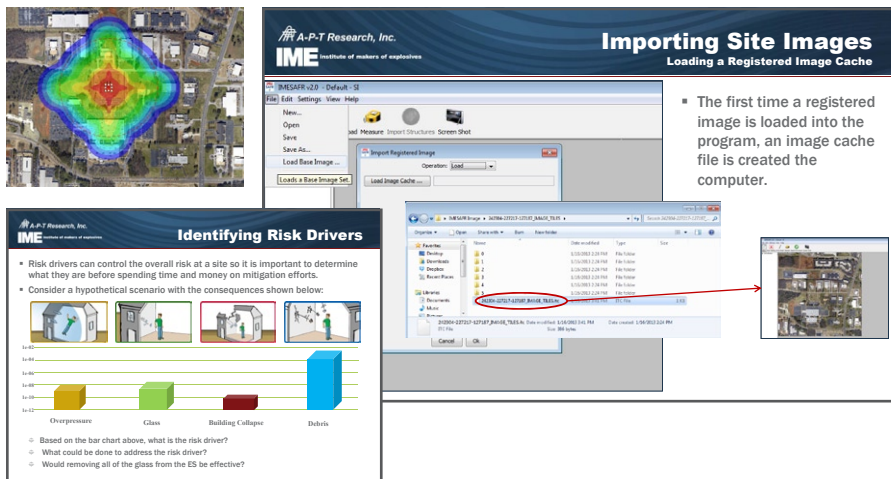
What is IMESAFR?

Institute of Makers of Explosives (IME) Safety Analysis for Risk (IMESAFR) is a software model that was developed through a joint effort by IME and A-P-T Research, Inc.

IMESAFR is a probabilistic risk assessment tool used to calculate risk to personnel from explosives facilities. This software not only calculates Quantity Distances (QD) based on the American Table of Distances and other QD regulations, it can determine a level of safety based upon risk.



IMESAFR uses the donor structure and activity, the structure of the exposed sites, and duration of exposed personnel to determine a level of safety. The program provides users with the ability to work in metric or imperial measures, and allows users to import maps or drawings of their site to assist with visualizing facility layouts and results.



Why was IMESAFR developed?

IMESAFR was developed to provide a more comprehensive assessment of the overall risk of explosives operations. The commercial explosives industry in the United States uses the American Table of Distances (ATD) as the basis for safe siting of explosives storage facilities. ATD siting involves the evaluation of a specific magazine and inhabited building or public highway, which are referred to as a Potential Explosion Site (PES)/Exposed Site (ES) pair in IMESAFR. This evaluation yields the recommended separation distance based on the factors that affect risk, including whether a barricade exists. Although the same criteria can be applied to explosives manufacturing operations, the ATD was intended for use in limited permanent storage situations. In addition to permanent storage situations, IMESAFR accounts for other activities such as manufacturing, assembly, and loading and unloading.

IMESA FR Training Course

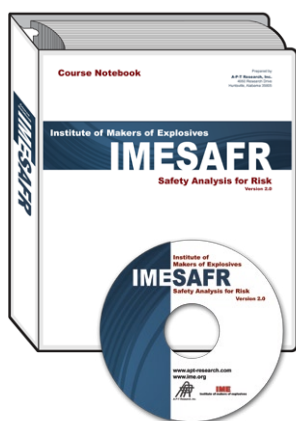
The course is presented over three days with eight hours of mixed lecture and discussion each day for a total of 24 classroom hours. Daily class hours are from 8am to 5pm with an hour for lunch and breaks mid-morning and mid-afternoon. A competency test will be given at the end of the course.

Class Size: minimum of 10, maximum of 25.

Where

The class is normally held at the APT Safety Engineering and Analysis Center (SEAC) in Huntsville, AL, conveniently located in Cummings' Research Park near Redstone Arsenal.

See www.apr-research.com/contacts/contactUs.html for detailed directions.



The class may also be offered at other locations. On-site training courses can be arranged, as well as courses that run in conjunction with conferences and meetings.

Course Content

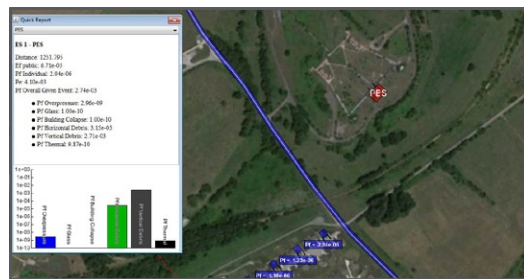
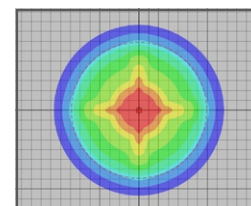
The IMESA FR Training Course will guide the user through the overall user interface of the IMESA FR Software. Some of the topics discussed are listed below.

- A background on the concepts and terminology used in the IMESA FR risk assessment software.
- A thorough guide on using input screens and choosing the proper input selection.
- A description of the capabilities of IMESA FR including menu options, functions of the tool bar, help menu and generating reports.
- An overview of the 26-step process used by IMESA FR to familiarize the user with the exposure and consequence analysis.
- Multiple examples (some worked individually and some as a group) demonstrating the various capabilities of IMESA FR.
- Practical applications of the software and its use in the risk management process.

Course Outline

1. Overview
2. QD Concepts & Background
3. QRA Concepts & Background
4. IMESA FR Features
5. Class Exercise 1
6. Risk Management
7. Advanced Tools
8. Architecture - Part 1
9. Architecture - Part 2
10. IMESA FR Protocols
11. Linking Architecture to Testing
12. Class Exercise 2
13. Approval Process
14. Input Decisions
15. Group Exercise
16. Test

Each student is responsible for bringing a laptop to training. A training book is included in the course fee.



Schedule

www.apr-research.com/capabilities/training.html

CEU

Upon completion of this course, attendees will be credited with 2.0 Continuing Education Units (CEU).

Cost

New IMESA FR 2.0:

- Non IME member: US\$1500
- IME member: US\$750

Upgrade IMESA FR 2.0:

- Non IME member: US\$750
- IME member: US\$375

Training voucher: US\$1500

Registration Information

To register for a class in Huntsville or if you are interested in setting up a training course at a location other than Huntsville, please contact:

Dean Nichols
256.327.3373
imesafrtraining@apr-research.com

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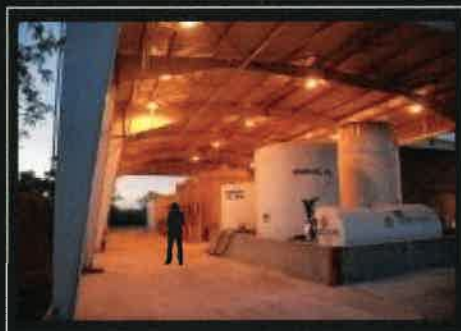


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International Society of
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DESTRUCTION OF COMMERCIAL EXPLOSIVE MATERIALS

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.



IME

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