Attachment 12

CLASS 8--CORROSIVE MATERIALS

A12.1. General Requirements. For military members, failure to obey the mandatory provisions from paragraphs A12.2. through A12.14. and any provisions of mandatory subparagraph(s) hereunder is a violation of Article 92, Uniform Code of Military Justice (UCMJ). Civilian employees who fail to obey the provisions from paragraph A12.2. through A12.14. and any provisions of mandatory subparagraph(s) hereunder are subject to administrative disciplinary action without regard to otherwise applicable criminal or civil sanctions. Personnel shall not deviate from these provisions and fully comply with the inner/receptacle packaging and outer container selection as mandated in packaging paragraph. **(T-0)**. Not all packaging paragraphs are inclusive and packaging selection is determined by the type of corrosive material and quantity shipped. This attachment contains information concerning the packaging and general handling instructions for Class 8 (corrosive materials). See Attachment 3 for other details concerning Class 8 material.

A12.2. Package Liquid Class 8 Materials as follows:

A12.2.1. Package in combination packagings with outer drums, barrels, jerricans, or boxes as follows:

Inner packaging	**Outer packaging**
Receptacles: Glass, earthenware, plastic, or metal **Note:** For PG I material inner packagings packed in a rigid and leakproof receptacle or intermediate packaging containing sufficient absorbent material to absorb the entire contents of all inner packagings before packing the inner packaging(s) in the outer package. **Note:** Inner packaging or receptacle closures of combination packages containing liquids held securely, tightly and effectively in place by secondary means. See A20.3.	**Drums:** steel (1A1 or 1A2), aluminum (1B1 or 1B2), plywood (1D), fiber (1G) plastic (1H1 or 1H2), or metal other than steel or aluminum (1N1 or 1N2) ***or*** **Barrel:** wood (2C2) **Note:** Wood barrel (2C2) not authorized for PG I material. ***or*** **Jerricans:** steel (3A1 or 3A2), aluminum (3B1 or 3B2) or plastic (3H1 or 3H2) ***or*** **Boxes:** steel (4A), aluminum (4B), natural wood (4C1 or 4C2), plywood (4D), reconstituted wood (4F), fiberboard (4G), expanded plastic (4H1), solid plastic (4H2), or other metal (4N)

A12.2.2. Package in single packaging drums, barrels, or jerricans as follows:

Inner packaging	Outer packaging
Not required	**Drums:** steel (1A1 or 1A2), aluminum (1B1 or 1B2), fiber (1G) with liner, plastic (1H1 or 1H2) or metal other than steel or aluminum (1N1 or 1N2) **Note:** Fiber drum (1G) with liner only authorized for PG II and III material. ***or*** **Barrel:** wood (2C1) **Note:** Wood barrel (2C1) not authorized for PG I material. ***or*** **Jerricans:** steel (3A1 or 3A2), aluminum (3B1 or 3B2), or plastic (3H1 or 3H2)

A12.2.3. Package in the following composite packagings with plastic inner receptacles:

Inner receptacle	Outer packaging
Plastic	**Drums:** Steel, aluminum, fiber, plastic, or plywood (6HA1, 6HB1, 6HG1, 6HH1, or 6HD1) **Note:** Plywood drums not authorized for PG I material. ***or*** **Boxes:** steel, aluminum, wooden, plywood or fiberboard (6HA2, 6HB2, 6HC, 6HD2, or 6HG2)

A12.2.4. Package in the following composite packagings with glass, porcelain, or stoneware inner receptacles:

Inner receptacle	Outer packaging
Glass, porcelain, or stoneware	**Drums:** steel, aluminum or fiber (6PA1, 6PB1, or 6PG1) ***or*** **Boxes:** steel, aluminum, wooden or fiberboard (6PA2, 6PB2, 6PC, or 6PG2) ***or*** solid or expanded plastic packaging (6PH1 or 6PH2) ***or*** plywood drum or wickerwork hamper (6PD1, 6PD2) **Note**: Plywood drum and wickerwork hamper not authorized for PG I material

A12.2.5. DOT Cylinders. DOT specification cylinders as prescribed for any compressed gas, except those for acetylene (8, 8AL) and DOT 3HT.

A12.3. Package Solid Class 8 Materials as follows:

A12.3.1. Package in combination packagings with outer drums, barrels, jerricans, or boxes as follows:

Inner packaging	**Outer packaging**
Receptacles: Glass, earthenware, plastic, or metal	**Drums:** steel (1A1 or 1A2), aluminum (1B1 or 1B2), plywood (1D), fiber (1G), plastic (1H1 or 1H2), or metal other than steel or aluminum (1N1 or 1N2) ***or*** **Barrel:** wood (2C2) ***or*** **Jerricans:** steel (3A1 or 3A2), aluminum (3B1 or 3B2), or plastic (3H1 or 3H2) ***or*** **Boxes:** steel (4A), aluminum (4B), Natural wood (4C1 or 4C2), plywood (4D), reconstituted wood (4F), fiberboard (4G), solid plastic box (4H2), or metal other than steel or aluminum (4N)

A12.3.2. Package in single packagings of drums, barrels, jerricans, boxes, or bags as follows:

Inner packaging	**Outer packaging**
Not required	**Drums:** steel (1A1 or 1A2), aluminum (1B1 or 1B2), plywood (1D), plastic (1H1 or 1H2), fiber (1G), or metal other than steel or aluminum (1N1 or 1N2) **Note:** Plywood (1D) is not authorized for PG I material. ***or*** **Barrel:** wood (2C1 or 2C2) **Note**: Wood barrels (2C1 or 2C2) not authorized for PG I material. ***or*** **Jerricans:** steel (3A1 or 3A2), aluminum (3B1 or 3B2), or plastic (3H1 or 3H2) ***or*** **Boxes:** steel or steel with liner (4A), aluminum or aluminum with liner (4B), natural wood (4C1), sift-proof natural wood (4C2), plywood (4D), reconstituted wood (4F), fiberboard (4G), expanded plastic (4H1), solid plastic (4H2) or metal other than steel or aluminum (4N) **Note:** Steel (4A), aluminum (4B), natural wood (4C1), plywood (4D), reconstituted wood (4F), fiberboard (4G), expanded plastic (4H1) or solid plastic (4H2) boxes are not authorized for PG I material. ***or*** **Bags:** woven plastic (5H1, 5H2, or 5H3); plastic film (5H4); textile (5L1, 5L2, or 5L3); or paper, multiwall, water-resistant (5M2) **Note:** Bags are not authorized for PG 1 material.

A12.3.3. Package in the following composite packagings with plastic inner receptacles:

Inner receptacle	Outer packaging
Plastic	**Drums:** steel, aluminum, plywood, fiber, or plastic (6HA1, 6HB1, 6HD1, 6HG1, or 6HH1) ***or*** **Boxes:** steel, aluminum, wood, plywood, or fiberboard (6HA2, 6HB2, 6HC, 6HD2, or 6HG2) **Note:** Boxes are not authorized for PG 1 material.

A12.3.4. Package in the following composite packagings with glass, porcelain, or stoneware inner receptacles:

Inner receptacle	Outer packaging
Glass, porcelain, or stoneware	**Drums:** steel, aluminum, plywood, or fiber (6PA1, 6PB1, 6PD1, or 6PG1) ***or*** **Boxes:** steel, aluminum, wooden, or fiberboard (6PA2, 6PB2, 6PC, or 6PG2) ***or*** expanded or solid plastic packaging (6PH1 or 6PH2)

A12.3.5. DOT Cylinders. DOT specification cylinders as prescribed for any compressed gas, except those for acetylene (8, 8AL) and DOT 3HT.

A12.4. Package Batteries, Wet, Filled with Acid; Batteries, Wet, Filled with Alkali; or Batteries, Wet, Non-spillable as follows:

A12.4.1. Package to prevent a dangerous evolution of heat (e.g., an amount of heat sufficient to be dangerous to packaging or personal safety to include charring of packaging, melting of packaging, scorching of packaging, or other evidence) and:

A12.4.1.1. Completely protect against short circuit with electrically nonconductive material and securely cushion electric storage batteries containing electrolyte acid or alkali corrosive battery fluid within the outer container,

A12.4.1.2. Separate batteries and battery-powered devices in a manner to prevent contact with other batteries or devices with electrically conductive materials,

A12.4.1.3. Place batteries inside an acid or alkali-proof liner (not mandatory for non-spillable batteries), adequately sealed to prevent leakage in the event of a spill, within the outer container as follows:

A12.4.1.4. Pack batteries so that the fill openings or vents, if any, are upward.

A12.4.1.5. Do not pack with other articles unless authorized by a specific packaging paragraph.

A12.4.1.6. However, batteries may be packed with portable searchlights, battery parts, or hydrometers, if properly cushioned and securely packed in a separate container.

A12.4.2. Pack batteries packed without other materials in boxes, drums, or jerricans as follows:

Inner packaging	Outer packaging
Not required	**Boxes:** wooden (4C1, 4C2, 4D, 4F), fiberboard (4G), or solid plastic (4H2) ***or*** **Drums:** plywood (1D), fiber (1G), or plastic (1H2) ***or*** **Jerrican:** plastic (3H2) **Note:** All outer packagings must meet PG II performance standards.

A12.4.3. Non-Spillable Batteries. Pack in strong outer packagings. To consider a battery non-spillable, it must withstand without leakage the vibration and pressure differential tests specified in 49 CFR Paragraph 173.159(f). **(T-0)**. Batteries meeting the additional requirement of Special Provision A67 are considered dry, and are not subject to any other requirements of this manual.

A12.4.4. Electrolyte, Acid, or Alkali Corrosive Battery Fluid, Packed with Storage Batteries Wet or Dry. Package as described below.

A12.4.4.1. Package in boxes with glass inner receptacles as follows:

Inner packaging	Outer packaging
Glass receptacles **Note:** Not over 4.0 L (1 gallon) capacity each.	**Boxes:** wooden box (4C1, 4C2, 4D, 4F) **Note:** Maximum quantity is 8.0 L (2 gallons) each. Cushion and separate the inside containers from batteries by a strong solid wooden partition.

A12.4.4.2. Package in boxes with plastic inner bottles as follows:

Inner packaging	Outer packaging
Plastic bottles **Note:** Not over 1 L (1 quart) capacity each.	**Boxes:** wooden box (4C1, 4C2, 4D, 4F) **Note:** Pack no more than 24 bottles, securely separated from storage batteries and filling kits in each package.

A12.4.4.3. Package dry storage batteries or battery charger devices in fiberboard boxes (4G) with inner receptacles containing battery fluid. Ensure complete package conforms to PG III requirements. Pack no more than 12 inner receptacles in one outer box. Maximum authorized gross weight is 34 kg (75 pounds).

A12.4.5. Batteries Packed without other materials (Domestic Shipments Only). The following nonspecification packagings are authorized for domestic only shipments of batteries packed without other materials:

A12.4.5.1. One to three batteries of not over 11.3 kg (25 pounds) each, packed in an outside box. Gross weight may not exceed 34 kg (75 pounds).

A12.4.5.2. A maximum of four batteries not over 7 kg (15 pounds) each may be packed in strong outside fiberboard or wooden boxes. Cushion and pack to prevent short circuits. Gross weight may not be over 30 kg (65 pounds).

A12.4.5.3. A maximum of five batteries not over 4.5 kg (10 pounds) each may be packed in an outside fiberboard or wooden box. Securely cushion and pack to prevent short circuits. Gross weight may not exceed 30 kg (65 pounds).

A12.4.5.4. Single batteries not over 34 kg (75 pounds) each, packed in five-sided slipcovers or in completely closed fiberboard boxes. Ensure slipcovers and boxes are of single or double-faced corrugated fiberboard of at least 91 kg (200 pounds) test strength. Fit the slipcover or the fiberboard box snugly and provide an inside top clearance of at least 1.3 cm (one-half inch) above battery terminals and filler caps with reinforcements in place. When assembled for shipment, the bottom edges of the slipcover may extend to the base of the battery and may not expose more than 25.4 mm (1 inch). Ensure the completed package (battery and box or slipcover) is capable of withstanding a top-to-bottom compression test without damage to the battery terminals, cell covers, or filler caps.

A12.4.5.5. Single batteries exceeding 34 kg (75 pounds) each may be packed in completely closed fiberboard boxes. Useb double-wall corrugated fiberboard boxes of at least 181 kg (400 pounds) test, or solid fiberboard testing at least 181 kg (400 pounds). A box may have holes in its ends provided that the handholes will not materially weaken the box. Sides and ends of the box may not be less than 1.3 cm (0.5 inch); and use excelsior pads, corrugated fiberboard, or other suitable cushioning material. Protect the bottom of the battery by a minimum of one excelsior or double-wall corrugated fiberboard pad. Protect the top of the battery by a wood frame, corrugated trays or scored sheets of corrugated fiberboard having minimum test of 91 kg (200 pounds), or other equally effective cushioning material. Ensure the top protection bears evenly on connectors and/or edges of the battery cover to facilitate stacking of batteries. No more than one battery may be placed in one box. The maximum authorized gross weight is 91 kg (200 pounds).

A12.4.5.6. Large electric storage batteries protected against short circuit and firmly secured to skids or pallets capable of withstanding the shocks normally incident to transportation. The height of the completed unit may not be greater than 1.5 times the width of the skid or pallet. Ensure the unit is capable of withstanding, without damage, a superimposed weight equal to two times the weight of the unit. If the weight of the unit is greater than 907 kg (2,000 pounds), ensure it withstands, without damage, a superimposed weight of 1814 kg (4,000 pounds). Do not rely on battery terminals to support any part of the superimposed weight and ensure terminals do not short out if an electrically conductive material is placed in direct contact with them. Mark and label each skid or pallet as required by Attachment 14 and Attachment 15.

A12.5. Package Bombs, Smoke, Nonexplosive as follows: Ship bombs, smoke, nonexplosive provided they are without ignition elements, bursting charges, detonating fuses, or other explosive components. Packaging meeting PG II performance standard is required. Package in steel (4A), aluminum (4B), wooden (4C1, 4C2), plywood (4D), reconstituted wood (4F), fiberboard (4G), solid plastic (4H2), or other metal (4N) boxes; or steel (1A2), aluminum (1B2), plywood (1D), fiber (1G), plastic (1H2), or other metal (1N2) drums.

A12.6. UN3547, Articles containing corrosive substance, N.O.S. are authorized when classified per paragraph A4.2.3., maximum net quantity per package 30 L for liquids and 50 kg for solids, when packaged, or unpackaged as follows:

A12.6.1. When packaged, packagings meeting PG II performance standard is rquired.

A12.6.1.1. Pack articles to prevent movement and inadvertent operation during normal conditions of transport.

A12.6.1.2. Pack inner receptacles containing liquids with closures in outer packagings with their closures correctly oriented.

A12.6.1.3. Where there is no receptacle within the article, ensure the article fully encloses the dangerous goods and prevent their release under normal conditions of transport.

Inner packaging	**Outer packaging**
Receptacles: constructed of suitable materials and secured in the article in such a way that, under normal conditions of transport, they cannot break, be punctured or leak their contents into the article itself or the outer packaging.	**Drums:** removable head steel (1A2), removable head aluminum (1B2), removable head metal other than steel or aluminum (1N2), plywood (1D), fiber (1G), or removable head plastic (1H2) ***or*** **Boxes:** steel (4A), aluminum (4B), ordinary natural wood (4C1), sift-proof natural wood (4C2), plywood (4D), reconstituted wood (4F), fiberboard (4G), expanded plastic (4H1), or solid plastic (4H2), other metal (4N) ***or*** **Jerricans:** removable head steel (3A2), plastic removable head (3H2), or aluminum removable head (3B2)

A12.6.2. Robust articles.

A12.6.2.1. Robust articles may be transported in strong outer packagings constructed of suitable material and of adequate strength and design in relation to the packaging capacity and its intended use; or,

A12.6.2.2. Robust articles may be transported unpackaged or on pallets when the dangerous goods are afforded equivalent protection by the article in which they are contained.

A12.7. Package Gallium as follows: Package gallium metal in semi-rigid plastic inside packaging of not more than a 2.5 kg (5.5 pounds) net capacity each, then individually enclosed in a sealed bag of strong, leak-tight, and puncture-resistant material impervious to liquid gallium. Place the sealed bag in a wooden (4C1, 4C2), plywood (4D), reconstituted wood (4F),

fiberboard (4G), plastic (4H1, 4H2) or metal, other than steel or aluminum (4N) boxes or in a steel (1A1, 1A2), fiber (1G), plastic (1H1 or 1H2), or metal, other than steel or aluminum (1N1, 1N2) drum lined with a strong, leak-tight, and puncture-resistant material impervious to liquid gallium. If necessary to keep in a solid state, enclose this packaging in a strong, water-resistant outer packaging that contains dry ice or other means of refrigeration. Refrigerate the gallium sufficiently to maintain in a completely solid state during the entire anticipated time it will be in transportation to its destination. If a refrigerant is used, ensure all packaging materials are chemically and physically resistant to the refrigerant and have impact resistance at the low temperatures of the refrigerant used. If dry ice is used, ensure the outer package permits the release of carbon dioxide gas. Packaging meeting PG I performance standard is required. Manufactured articles, each not containing more than 100 mg (0.0035 ounce) of gallium and packaged so that the quantity per package does not exceed 1 g (0.35 ounce) are not subject to any other requirements of this manual (see paragraph A3.1.16.3.).

A12.8. Package Hydrogen Fluoride as follows: Package hydrogen fluoride (hydrofluoric acid, anhydrous) in cylinders, DOT 3, 3A, 3AA, 3B, 3BN, or 3E; also DOT 4B, 4BA, 4BW if not brazed. Filling density may not exceed 85 percent of the water weight capacity of the cylinder. In place of the periodic volumetric expansion test required, cylinders used exclusively in this manner may be given a complete external visual inspection in conformance with 49 CFR Part 180, Subpart C at the time such periodic inspection becomes due and documented.

A12.9. Package Mercury (Metallic and Articles Containing Mercury) as follows:

A12.9.1. Handling Instructions. Mercury is poisonous in liquid and vapor form and can be absorbed through the skin at room temperature. It is corrosive to aluminum and its alloys. It expands on freezing, and may crack glass containers.

A12.9.2. Packaging Requirements. Packaging meeting the PG I performance standard is required. Pack inner containers with sufficient cushioning material to prevent breakage. Ensure either the inner packaging or the outer packaging has an inner liner or bags of strong leak-proof and puncture-resistant material, impervious to mercury, completely surrounding the contents and sealed which prevents the escape of mercury from the package irrespective of its position. Manufactured articles, each containing not more than 100 mg (0.0035 ounce) of mercury and packaged so that the quantity of mercury per package does not exceed 1 g (0.0035 ounce) are not subject to any other requirements of this manual (see paragraph A3.1.16.4.). Package mercury as follows:

A12.9.2.1. In inner earthenware, glass, or suitable plastic receptacles containing not more than 3.5 kg (7.7 pounds), glass ampoules containing not more than 0.5 kg (1.1 pounds), or iron or steel quicksilver flasks containing not more than 35 kg (77 pounds) of mercury. Package in outer steel (1A1, 1A2), plywood (1D), fiber (1G), or metal, other than steel or aluminum (1N1, 1N2) drums; steel jerricans (3A2); wooden (4C1, 4C2), plywood (4D), reconstituted wood (4F), fiberboard (4G), plastic (4H2), or metal, other than steel or aluminum (4N) boxes.

A12.9.2.2. Specification packagings are not required for manufactured articles or apparatuses containing mercury when packaged as follows:

A12.9.2.2.1. Manufactured articles or apparatus of which metallic mercury is a component part (manometers, pumps, thermometers, switches, etc.), except as otherwise covered in A12.9. Package these items in a strong outer packaging. The inner liner and cushioning requirements of A12.9.2. apply.

A12.9.2.2.2. Mercury switches and relays are excepted from this manual if they are of the totally enclosed leak-proof type in sealed metal or plastic units. Thermometers, switches, and relays each containing a total quantity of not more than 15 g (0.53 ounces) of mercury, are also excepted if installed as an integral part of a machine or apparatus and so fitted that damage or leakage of mercury is unlikely to occur under conditions normally incident to transport.

A12.9.2.3. Package electrons tubes, mercury vapor tubes, and similar tubes as follows:

A12.9.2.3.1. In strong outer packagings with all seams and joints sealed with self adhesive, pressure-sensitive tape that prevents the escape of mercury from the package. The maximum net quantity is 450 g (15.9 ounces) of mercury per package.

A12.9.2.3.2. Package tubes with more than 450 g (15.9 ounces) of mercury in strong outer packagings having sealed inner liners or bags of strong leak-proof and puncture-resistant material impervious to mercury, completely surrounding the contents which prevents the escape of mercury from the package irrespective of its position.

A12.9.2.3.3. Tubes which do not contain more than 5 g (0.2 ounces) of mercury each and that are packed in the manufacturer's original packaging. Maximum total net quantity is 30 g (1.1 ounces) of mercury per package.

A12.9.2.3.4. Tubes which are completely jacketed in sealed leak-proof metal cases and are packed in the manufacturer's original packaging.

A12.9.2.4. Mercurial barometers complying with A12.9.2.2.1., that are loaded and unloaded from an aircraft under the supervision of, and are accompanied in flight by a US weather official or a similar US agency official (e.g., Air Weather Service personnel), are excepted from any other requirements of this manual.

A12.10. Package Nitrating Acid Mixtures; Nitrating Acid Mixtures, Spent; or Nitric Acid as follows: Do not package nitric acid exceeding 40 percent concentration with any other material. Package nitric acid as follows:

A12.10.1. Pack nitric acid in any concentration, which does not contain sulfuric acid or hydrochloric acid as impurities, in:

A12.10.1.1. Stainless steel drum (1A1). Do not ship containers weighing less than 85 percent of their original marked weight. Stainless steel used in drums must be at least 0.9 mm (.035 inches) for 55 L (15 gallon) nominal capacity, 1.2 mm (.047 inches) for 115 L (30 gallon) nominal capacity, and 1.5 mm (.059 inches) for 210 L (55 gallon) nominal capacity. **(T-0)**. Type 304 or other grades of equivalent corrosion-resistant steel in as-welded condition are authorized for nitric acid concentrations of up to and including 78 percent. In addition to the UN specification markings, the marking as specified in 49 CFR Subparagraph 173.158(b)(1) must be included on the drum. **(T-0)**. An example of this marking is: 304HT/1.9/2.7/TW55. For all other concentrations of nitric acid the following are authorized:

A12.10.1.1.1. Type 304 heat-treated (quenched in water at 1040 degrees C [1900 degrees F]).

A12.10.1.1.2. Stabilized type 347 in the as-welded condition.

A12.10.1.1.3. Stabilized type 347 stress-relieved (845-900 degrees C [1550-1650 degrees F]).

A12.10.1.1.4. Stabilized type 347 heat-treated (quenched in water at 1040 degrees C [1900 degrees F]).

A12.10.1.1.5. Other grades of equivalent corrosion resistance.

A12.10.1.2. Expanded plastic box (4H1), with inner glass receptacles not over 2.5 L (0.66 gallons) capacity each. Pack no more than four glass inner receptacles in one outer packaging.

A12.10.2. Pack nitric acid of 90 percent or greater concentration in a wooden box (4C1, 4C2, 4D, or 4F), with inner glass bottles not over 2.5 L (0.66 gallons) capacity each. Individually pack and cushion the inside containers in tightly closed metal containers, then pack in the outer container.

A12.10.3. Pack nitric acid, of 80 percent or greater concentration that does not contain sulfuric acid or hydrochloric acid as impurities, in an aluminum drum (1B1). Maximum quantity is 38 L (10 gallons).

A12.10.4. Package nitric acid of less than 90 percent concentration in steel (4A), aluminum (4B), natural wood (4C1, 4C2), plywood (4D), reconstituted wood (4F), fiberboard (4G) or other metal (4N) boxes with inside glass bottles not over 2.5 L (0.66 gallons) capacity each.

A12.10.5. Package nitric acid of more than 70 percent concentration in outer steel (1A2), aluminum (1B2), plywood (1D), fiber (1G), plastic (1H2) or metal, other than steel or aluminum (1N2) drums; plastic jerricans (3H2); steel (4A), aluminum (4B), Natural wood (4C1, 4C2), plywood (4D), reconstituted wood (4F), fiberboard (4G), or metal, other than steel or aluminum (4N) boxes with inside containers:

A12.10.5.1. Glass or earthenware containers not over 1 L (1 quart) capacity each.

A12.10.5.2. Glass ampoules not over 0.5 L (1 pint) capacity each.

A12.10.6. Pack nitric acid of 70 percent or less concentration in outer steel (1A2), aluminum (1B2), plywood (1D), fiber (1G), plastic (1H2) or metal, other than steel or aluminum (1N2) drums; plastic jerricans (3H2); steel (4A), aluminum (4B), Natural wood (4C1, 4C2), plywood (4D), reconstituted wood (4F), fiberboard (4G), or metal, other than steel or aluminum (4N) boxes with inside containers:

A12.10.6.1. Glass or earthenware not over 2.5 L (0.66 gallon) capacity each.

A12.10.6.2. Plastic not over 2.5 L (0.66 gallon) capacity each further individually placed into tightly closed metal packaging.

A12.10.6.3. Glass ampoules not over 0.5 L(0.1 gallon) capacity each.

A12.10.7. Pack nitric acid of 70 percent or less concentration in composite packaging (6PA1, 6PA2, 6PB1, 6PB2, 6PC, 6PD1, 6PH1, 6PH2). Composite packaging 6HH1 and 6HA1 meeting the compatibility requirements of 49 CFR Paragraph 173.24(e) are also authorized.

A12.10.8. Pack nitric acid of 70 percent or less concentration in outer plastic box (4H1) with inside glass packaging containing not more than 2.5 L (0.66 gallon) each.

A12.11. Package Class 8 Materials With an Inhalation Hazard (Hazard Zone A and B) as follows:

A12.11.1. Handling Instructions. These items are extremely dangerous. Make available approved chemical safety mask and clothing when handling this material, and wear when handling leaking packages.

A12.11.2. Hazard Zone A Packaging Requirements. Package Class 8 materials with an Inhalation Hazard Zone A as follows:

A12.11.2.1. In seamless DOT or UN specification cylinders that conform to 49 CFR Section 173.40 and one of the specifications for cylinders in 49 CFR Part 178, Subpart C, except that specification 8, 8AL, and 39 cylinders are not authorized. Use cylinders meeting the requirements of A3.3.2.

A12.11.2.2. In an inner drum (1A1, 1B1, 1H1, 1N1 , or 6HA1), then place in an outer drum (1A2 or 1H2). Test both the inner and outer drum to the PG I performance level. Ensure an outer 1A2 drum has a minimum thickness of 1.35 mm (0.053 inches). Ensure an outer 1H2 drum has a minimum thickness of 6.30 mm (0.248 inches). The capacity of the inner drum may not exceed 220 L (58 gallons). Ensure the outer drum (1A2 or 1H2) withstands a hydrostatic test pressure of 100kPa (15 psig). Cushion the inner drum within the outer drum with a shock-mitigating, nonreactive material which completely surrounds the inner packaging on all sides. The inner drum must also meet the following requirements:

A12.11.2.2.1. Satisfactorily withstand a hydrostatic pressure test (as outlined in 49 CFR Section 178.605) of 300 kPa (45 psig).

A12.11.2.2.2. Satisfactorily withstand a leakproofness test (as outlined in 49 CFR Section 178.604) using an internal air pressure at 55 degrees C (131 degrees F) of at least twice the vapor pressure of the material to be packaged.

A12.11.2.2.3. Have screw-type closures that meet all the following requirements:

A12.11.2.2.3.1. Closed and tightened to a torque as prescribed by the closure manufacturer, using a device that is capable of measuring torque.

A12.11.2.2.3.2. Physically held in place by any means capable of preventing back-off or loosening of the closure by impact or vibration during transportation.

A12.11.2.2.3.3. Provided with a cap seal that is properly applied according to the cap seal manufacturer's recommendations. The cap seal must be capable of withstanding an internal pressure of at least 100 kPa (15 psig).

A12.11.2.2.4. Meet the following minimum thickness requirements:

A12.11.2.2.4.1. 1A1 and 1N1 drums must have a minimum thickness of 1.3 mm (0.051 inch).

A12.11.2.2.4.2. 1B1 drums must have a minimum thickness of 3.9 mm (0.154 inch).

A12.11.2.2.4.3. 1H1 drums must have a minimum thickness of 3.16 mm (0.124 inch).

A12.11.2.2.4.4. 6HA1 drums the plastic inner container must have a minimum thickness of 1.58 mm (0.0622 inch) and the outer steel drum must have a minimum thickness of 0.96 mm (0.0378 inch). **(T-0)**.

A12.11.2.3. Pack in combination packagings with an inner packaging system that consists of an impact-resistant receptacle of glass, earthenware, plastic, or metal, securely cushioned with a nonreactive absorbent material packed within a leak-tight packaging of metal or plastic. The capacity of the inner receptacle may not exceed 4 L (1 gallon). An inner receptacle that has a closure must have a closure that is held in place by any means capable of preventing back-off or loosening of the closure by impact or vibration during transportation. **(T-0)**. Pack the inner packaging system in an outer steel drum (1A2), aluminum drum (1B2), , plywood drum (1D), fiber drum (1G), plastic drum (1H2), metal drum (other than steel or aluminum) (1N2), steel box (4A), aluminum box (4B), natural wood box (4C1 or 4C2), plywood box (4D), reconstituted wood box (4F), fiberboard box (4G), expanded plastic box (4H1), solid plastic box (4H2) or metal box (other than steel or aluminum) (4N). Ensure both the inner packaging system and the outer container each meets the test requirements of the PG I performance level independently. The total amount of liquid that can be packed in the outer container may not exceed 16 L (4 gallons).

A12.11.3. Hazard Zone B Packaging Requirements. Package Class 6.1, PG I materials with an Inhalation Hazard Zone B as follows:

A12.11.3.1. In seamless DOT or UN specification cylinders that conform to 49 CFR Section 173.40 and one of the specifications for cylinders in 49 CFR Part 178, Subpart C, except that specification 8, 8AL, and 39 cylinders are not authorized. Ensure cylinders also meet the requirements of A3.3.2.

A12.11.3.2. In an inner drum (1A1, 1B1, 1H1, 1N1 , or 6HA1), then place in an outer drum (1A2 or 1H2). Test both the inner and outer drum to the PG I performance level. Ensure an outer 1A2 drum has a minimum thickness of 1.35 mm (0.053 inches). Ensure an outer 1H2 drum has a minimum thickness of 6.30 mm (0.248 inches). The capacity of the inner drum may not exceed 220 L (58 gallons). Ensure the outer drum (1A2 or 1H2) withstands a hydrostatic test pressure of 100kPa (15 psig). Cushion the inner drum within the outer drum with a shock-mitigating, nonreactive material which completely surrounds the inner packaging on all sides. The inner drum must also meet the following requirements:

A12.11.3.2.1. Satisfactorily withstand a leakproofness test (as outlined in 49 CFR Section 178.604) using an internal air pressure at 55 degrees C (131 degrees F) of at least twice the vapor pressure of the material to be packaged.

A12.11.3.2.2. Have screw-type closures that meet all the following requirements:

A12.11.3.2.2.1. Closed and tightened to a torque as prescribed by the closure manufacturer, using a device that is capable of measuring torque.

A12.11.3.2.2.2. Physically held in place by any means capable of preventing back-off

or loosening of the closure by impact or vibration during transportation.

A12.11.3.2.2.3. Provided with a cap seal that is properly applied according to the cap seal manufacturer's recommendations. The cap seal must be capable of withstanding an internal pressure of at least 100 kPa (15 psig).

A12.11.3.2.3. Meet the following minimum thickness requirements:

A12.11.3.2.3.1. 1A1 and 1N1 drums must have a minimum thickness of 0.69 mm (0.027 inch).

A12.11.3.2.3.2. 1B1 drums must have a minimum thickness of 2.79 mm (0.110 inch).

A12.11.3.2.3.3. 1H1 drums must have a minimum thickness of 1.14 mm (0.045 inch).

A12.11.3.2.3.4. 6HA1 drums the plastic inner container must have a minimum thickness of 1.58 mm (0.0622 inch) and the outer steel drum must have a minimum thickness of 0.70 mm (0.027 inch). **(T-0)**.

A12.12. Package Fuel Cell Cartridges as follows:

A12.12.1. The weight of the fuel cells may not exceed 1 kg.

Inner packaging	Outer packaging
Not required	**Drums:** steel (1A2), aluminum (1B2), plywood (1D), Fiber (1G), plastic (1H2), other metal (1N2) ***or*** **Jerricans:** steel (3A2), aluminum (3B2), plastic (3H2) ***or*** **Boxes:** steel (4A), aluminum (4B), wood (4C1, 4C2), plywood (4D), reconstituted wood (4F), fiberboard (4G), plastic (4H2), other metal (4N)

A12.13. Fuel Cells Contained in Equipment

A12.13.1. UN specification packaging is not required. Pack fuel cells in strong outer container. Protect installed fuel cells in equipment against short circuit, and protect the entire system against inadvertent operation. Fuel cell systems may not charge batteries during transport.

A12.13.2. Protect the terminals of the installed fuel cells to prevent short circuit by use of protective coverings, taping, etc.

A12.14. Fuel Cells Packed With Equipment

A12.14.1. UN specification packaging is not required. Pack fuel cells in strong outer container. Pack fuel cells in inner packagings or pack in the outer packaging with cushioning material or divider(s) in order to protect against damage that may be caused by the movement or placement of contents within the outer packaging. The maximum number of fuel cell cartridges in the intermediate packaging may not be more than the number required to power the equipment plus two spares.

A12.15. Package Chlorosilanes as follows: Packaging meeting the PG I or PG II performance standard is required.

A12.15.1. Package in the following combination drums, or boxes:

Inner packaging	**Outer packaging**
Receptacles: Glass, or steel	**Drums:** steel (1A2), plywood (1D), fiber (1G), or plastic (1H2) ***or*** **Boxes:** steel (4A), natural wood (4C1 or 4C2), plywood (4D), reconstituted wood (4F), fiberboard (4G), expanded plastic (4H1), or solid plastic (4H2)

A12.15.2. Package in the following composite drums:

Inner receptacle	**Outer packaging**
Plastic	**Drums:** steel drum (6HA1)

A12.15.3. Package in the following single drums, or jerricans:

Inner packaging	**Outer packaging**
Not required	**Drums:** steel (1A1) ***or*** **Jerricans:** steel (3A1)

A12.15.4. Package in Cylinders as prescribed for any compressed gas, except Specification 8, 8AL, and 3HT cylinders.