

APPENDIX A

DOT-7A, TYPE A PACKAGING QUALIFICATION CHECKLIST

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1.0 CONTENTS CHARACTERIZATION

1.1 RADIOLOGICAL

In the following table identify the radionuclides present in the material. Identify the specific isotopes; for each isotope present identify the quantity in becquerel. If the material is special form, identify the A₁ value; if normal form, identify the A₂ value. Identify the weight in grams of the radionuclides present in the material when known. If nuclide is fissile, identify it as such. Identify the decay heat. Determine the total for each column.

RADIONUCLIDES	QUANTITY (per package)					DECAY HEAT
	Becquerel	A ₁	A ₂	Grams	Grams Fissile	Watts/gram
Totals						

(Use extra sheets if needed.)

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Using the identified radionuclides determine the associated radiation types.

- Photons (X and gamma rays)
- Alpha particles
- Beta particles (includes positrons)
- Neutron particles
- Other important radiations. Identify.

1.2 PHYSICAL FORM

1.2.1 Weight/Density

Identify the total weight in grams for the material in which the radioactivity is distributed.

Total weight of the load _____ grams.

Identify the density of the load.

Density of the load _____ (kg/m³)

1.2.2 Phase Solid, Liquid, or Gas

Identify if material is special form or normal form. Determine the physical form of the material. Identify if it is a solid, liquid or gas. If the material is a solid, identify if it is considered form 1, 2, 3, or a heavy, bulky solid. For heavy, bulky materials (e.g., concrete chunks, motors, and pumps), equipment/materials with sharp corners or protrusions, or material/equipment geometries that could result in highly localized forces, ensure that the contents are securely fastened/positioned within the package to prevent damage to the packaging. Identify the density of the material. For liquids identify the specific gravity and viscosity. For gas identify the volume at standard temperature and pressure (STP). Indicate if a phase change(s) can occur over the required temperature range.

Form Category: Normal Special (see 49 CFR 173.469)

Physical Form: Solid Form 1 Form 2 Form 3

Heavy, bulky solid requiring dunnage.

Liquid Specific gravity: _____ Viscosity: _____

Gas Volume: _____ (cm³ at STP)

Phase Change: Phase No Phase change

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1.4.2 Hazardous Materials Proper Shipping Names

PROPER SHIPPING NAME	IDENTIFICATION NUMBER	EXPECTED QUANTITY (per package)		
		Solids (grams)	Liquids (ml)	Gases (cm ³ at STP)

(Use extra sheets if needed.)

1.4.3 Organic Chemicals

NAME OF ORGANIC CHEMICALS	EXPECTED QUANTITY (per package)

(Use extra sheets if needed.)

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2.0 CLASSIFICATION OF CONTENTS

2.1 IS THE MATERIAL RADIOACTIVE?

Determine if material is radioactive for transportation. Divide the total radioactive in becquerel (Section 1.1) by the weight of the material in grams (Section 1.2.1)

$$\frac{\text{Total activity Bq}}{\text{Total material g}} = X \text{ Bq/g}$$

If $X > 70$ material is radioactive for transportation.

For transportation, the material is classified as: Radioactive Nonradioactive

2.2 IS THE MATERIAL NONFISSILE OR FISSILE EXEMPT?

Are fissile nuclides present? If no, the material is nonfissile. If yes, can the material meet the conditions in 10 CFR 71.53? If yes, the material is fissile exempt. If no, the material is fissile and requires a certified packaging. Check the appropriate box.

Nonfissile Fissile Exempt Fissile (Certified Package Required)

2.3 CAN TYPE A QUANTITY LIMITS BE MET?

If more than one nuclide is present, determine the A_1 or A_2 value, as applicable, for the mixture. If only one nuclide is present, use the value from the table. Determine if the total activity to be placed in the package is less than or equal to a Type A quantity.

A_1 or A_2 value calculated or from table _____ TBq.

Type A quantity present Yes No

If yes, identify the proper shipping name from 49 CFR 172.101 Hazardous Materials Table.

For the identified proper shipping name, does the entry in column 8 (Packaging) identify 49 CFR 173.415?

49 CFR 173.415 referenced. Yes No

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3.0 PACKAGING SELECTION

3.1 AUTHORIZED TYPE A PACKAGING CATEGORY SELECTED

The DOT authorizes four categories of packagings for use when shipping Type A quantities of radioactive material. Identify the category selected.

Specification 7A, General Packaging, Type A. For packaging in this category, completion of this checklist will identify required documentation.

Other Type A Packagings. When using other Type A packagings, be sure to register as a user and follow all conditions of use identified for the packaging.

Type B Packagings. When using a Type B packaging, be sure to register as a user and follow all conditions of use identified for the packaging. If using a Type B packaging as a Type A packaging, conduct required evaluations. The documentation requirements identified in this document apply to a Type B packaging as a Type A packaging.

Foreign-made Packagings. When using a foreign-made packaging, obtain the packaging's documentation and verify the packaging was used for import. While not directly applicable, this checklist provides some idea of the type of documentation that should be found.

- Packaging meets the standards in International Atomic Energy Agency (IAEA) *Regulations for the Safe Transport of Radioactive Material, 1995 Edition*, Safety Series No. 6 (IAEA 1990) and bears the marking "Type A."
- Packaging was used for the import of Class 7 (radioactive) materials.
- Possess the applicable documentation of tests and engineering evaluations and maintain the documentation on file in accordance with 49 CFR 173.415(a).

3.2 PHYSICAL CHARACTERISTICS OF THE LOAD

Selection of a proper packaging requires knowledge of the physical characteristics of the load. Space is provided in the following subsections to identify where the documentation for the radiological, physical, thermal, and chemical data for the load is found. The information is needed to document compatibility of the load with the packaging.

3.2.1 Radiological Characteristics

If not provided in Section 1 of the checklist, identify where the documentation of radionuclides present in the load can be found.

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3.2.2 Physical Characteristics

If not provided in Section 1 of the checklist, identify where the documentation of physical characteristics of the load can be found.

3.2.3 Physical Phase, Solid, Liquid, or Gas

If not provided in Section 1 of the checklist, identify where the documentation of physical characteristics of the load can be found.

3.2.4 Gas Generation

If not provided in Section 1 of the checklist, identify where the documentation of gas generation by the load can be found.

3.2.5 Thermal

If not provided in Section 1 of the checklist, identify where the documentation on thermal characteristics of the load can be found.

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3.2.6 Chemical Characteristics

If not provided in Section 1 of the checklist, identify where the documentation of chemical characteristics of the load can be found.

3.2.7 Transportation Mode Differences

Identify the mode of transportation.

- Aircraft. Highway, rail, vessel.

If shipment is by aircraft, identify if the package contents are liquid, solid, or gas.

- Liquid. Solid. Gas.

If shipment is by air and is liquid, does the packaging meet the minimum pressure differential of 95 kPa (13.8 lb/in²).

- Yes. No, do not use packaging for shipment of liquid by aircraft.

If liquid, do the contents require the ability to meet a higher differential pressure? If yes, identify the pressure required and documentation that shows the packaging meets the requirement.

Is the packaging vented?

- No. Yes, do not use packaging for shipment by aircraft.

Are closures held securely in place and prevented from loosening due to vibration and temperature changes?

- Yes. No, do not use packaging for shipment by aircraft.

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4.0 REGULATORY REQUIREMENTS

4.1 49 CFR 173.24 GENERAL REQUIREMENTS FOR PACKAGINGS AND PACKAGES.

173.24(a) Applicability.

(a) Applicability. Except as otherwise provided in this subchapter, the provisions of this section apply to--

- (1) Bulk and non-bulk packagings;**
- (2) New packagings and packagings which are reused; and**
- (3) Specification and non-specification packagings.**

All DOT-7A, Type A packagings fall into one or more of the identified categories. Indicate below the type of documentation that shows this requirement is met and where the documentation can be found.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

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173.24(b) Containment.

(b) Each package used for the shipment of hazardous materials under this subchapter shall be designed, constructed, maintained, filled, its contents so limited, and closed, so that under conditions normally incident to transportation--

- (1) Except as otherwise provided in this subchapter, there will be no identifiable (without the use of instruments) release of hazardous materials to the environment;**
- (2) The effectiveness of the package will not be substantially reduced; for example, impact resistance, strength, packaging compatibility, etc. must be maintained for the minimum and maximum temperatures encountered during transportation;**
- (3) There will be no mixture of gases or vapors in the package which could, through any credible spontaneous increase of heat or pressure, significantly reduce the effectiveness of the packaging.**

These requirements apply to DOT-7A, Type A packagings. Documentation of the ability of the packaging to meet the more severe requirements of 49 CFR 173, Subpart I, can be used to document compliance. Indicate below the type of documentation that shows these requirements are met and where the documentation can be found.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

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173.24(c) Authorized Packagings.

- (c) **Authorized packagings. A packaging is authorized for a hazardous material only if--**
- (1) **The packaging is prescribed or permitted for the hazardous material in a packaging section specified for that material in Column 8 of the §172.101 table and conforms to applicable requirements in the special provisions of Column 7 of the §172.101 table and, for specification packagings (but not including UN standard packagings manufactured outside the United States), the specification requirements in parts 178 and 179 of this subchapter; or**
 - (2) **The packaging is permitted under, and conforms to, provisions contained in §§171.11, 171.12, 171.12a, 173.3, 173.4, 173.5, 173.7, 173.27 or 176.11 of this subchapter.**

DOT-7A, Type A packagings are authorized for packaging for Type A quantities of radioactive materials. Indicate below the type of documentation that shows the load is a Type A quantity and where the documentation can be found.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

DOT-7A, TYPE A PACKAGING QUALIFICATION CHECKLIST

173.24(d) Specification Packagings and UN Standard Packagings Manufactured Outside the U.S.--

(d) Specification packagings and UN standard packagings manufactured outside the U.S. –

(1) Specification packagings. A specification packaging, including a UN standard packaging manufactured in the United States, must conform in all details to the applicable specification or standard in part 178 or part 179 of this subchapter.

A DOT-7A, Type A packaging is a specification packaging. Documentation of the ability of the package to meet the packaging requirements identified in 49 CFR 173.415(a) will document compliance with this requirement. Indicate below the type of documentation that shows this requirement is met and where the documentation can be found.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

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173.24(d) Specification Packagings and UN Standard Packagings Manufactured Outside the U.S.--

(2) UN standard packagings manufactured outside the United States. A UN standard packaging, manufactured outside the United States, in accordance with national or international regulations based on the UN Recommendations of the Transport of Dangerous Goods, may be imported and used and is considered to be an authorized packaging under the provisions of paragraph (c)(1) of this section, subject to the following conditions and limitations:

- (i) The packaging fully conforms to applicable provisions in the UN Recommendations on the Transport of Dangerous Goods and the requirements of this subpart, including reuse provisions;**
- (ii) The packaging is capable of passing the prescribed tests in part 178 of this subchapter applicable to that standard; and**
- (iii) The competent authority of the country of manufacture provides reciprocal treatment for UN standard packagings manufactured in the U.S.**

This requirement applies to DOT-7A, Type A packagings manufactured outside the U.S. Indicate below if the requirement does or does not apply. If applicable, indicate below the form of documentation and where the documentation can be found.

This requirement does not apply. The DOT-7A, Type A packaging being used was manufactured in the U.S.

This requirement applies as the packaging being used was manufactured outside the U.S.

Documentation of the packaging's ability to meet the more severe requirements of 49 CFR 173, Subpart I, can be used to document compliance.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

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173.24(e) Compatibility.

(e) Compatibility.

(1) Even though certain packagings are specified in this part, it is, nevertheless, the responsibility of the person offering a hazardous material for transportation to ensure that such packagings are compatible with their lading. This particularly applies to corrosivity, permeability, softening, premature aging and embrittlement.

This requirement applies to DOT-7A, Type A packagings. Indicate below the type of documentation that shows the lading is compatible with the packaging and identify where the documentation can be found.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

173.24(e) Compatibility. (Continued)

(2) Packaging materials and contents must be such that there will be no significant chemical or galvanic reaction between the materials and contents of the package.

This requirement applies to DOT-7A, Type A packagings. Indicate below the type of documentation that shows there will be no significant chemical or galvanic reactions and where the documentation can be found.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

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173.24(e) Compatibility. (Continued)

(3) Plastic packagings and receptacles.

(i) Plastic used in packagings and receptacles must be of a type compatible with the lading and may not be permeable to an extent that a hazardous condition is likely to occur during transportation, handling or refilling.

(ii) Each plastic packaging or receptacle which is used for liquid hazardous materials must be capable of withstanding without failure the procedure specified in appendix B of this part ("Procedure for Testing Chemical Compatibility and Rate Permeation in Plastic Packagings and Receptacles"). The procedure specified in appendix B of this part must be performed on each plastic packaging or receptacle used for Packing Group I materials. The maximum rate of permeation of hazardous lading through or into the plastic packaging or receptacles may not exceed 0.5 percent for the materials meeting the definition of a Division 6.1 material according to §173.132 and 2.0 percent for other hazardous materials, when subjected to a temperature no lower than—

(A) 18 °C (64 °F) for 180 days in accordance with Test Method 1 in appendix B of this part;

(B) 50 °C (122 °F) for 28 days in accordance with Test Method 2 in appendix B of this part; or

(C) 60 °C (140 °F) for 14 days in accordance with Test Method 3 in appendix B of this part.

(iii) Alternate procedures or rates of permeation are permitted if they yield a level of safety equivalent to or greater than that provided by paragraph (e)(3)(ii) or this section and are specifically approved by the Associate Administrator for Hazardous Materials Safety.

This requirement applies to DOT-7A, Type A packagings that use plastic containers to retain the load. Otherwise, the requirement does not apply. Remember to consider secondary hazards. Based on the materials of construction used for holding the load, indicate below if the requirement applies or does not apply. If the requirement applies, identify the documentation that shows compliance and identify where the documentation can be found.

This requirement: Does not apply. Applies; indicate the following.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

DOT-7A, TYPE A PACKAGING QUALIFICATION CHECKLIST

173.24(e) Compatibility. (Continued)

- (4) Mixed contents. Hazardous materials may not be packed or mixed together in the same outer packaging with other hazardous or nonhazardous materials if such materials are capable of reacting dangerously with each other and causing--**
- (i) Combustion or dangerous evolution of heat;**
 - (ii) Evolution of flammable, poisonous, or asphyxiant gases; or**
 - (iii) Formation of unstable or corrosive materials.**
- (5) Packagings used for solids, which may become liquid at temperatures likely to be encountered during transportation, must be capable of containing the hazardous material in the liquid state.**

These requirements are applicable to DOT-7A, Type A packagings. The requirements are load dependent. The primary hazards in a DOT-7A, Type A packaging are not likely to result in the identified hazards. However, secondary hazards are commonly associated with the radioactivity and should be watched for the potential to produce the identified conditions. The potential for a phase change exists with radioactive materials. An evaluation of the potential for a phase change should be made and documented. Indicate below if the requirements apply or do not apply. If the requirements apply, identify the type documentation used to show compliance and where the documentation can be found.

These requirements: Do not apply. Apply; indicate the following.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

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173.24(f) Closures.

(f) Closures.

(1) Closures on packagings shall be so designed and closed that under conditions (including the effects of temperature and vibration) normally incident to transportation--

(i) Except as provided in paragraph (g) of this section, there is no identifiable release of hazardous materials to the environment from the opening to which the closure is applied; and

(ii) The closure is secure and leakproof.

(2) Except as otherwise provided in this subchapter, a closure (including gaskets or other closure components, if any) used on a specification packaging must conform to all applicable requirements of the specification.

These requirements apply to DOT-7A, Type A packagings. Indicate below the type of documentation that shows the requirements are met and where the documentation can be found.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

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173.24(g) Venting.

- (g) Venting of packagings, to reduce internal pressure which may develop by the evolution of gas from the contents, is permitted only when--**
- (1) Transportation by aircraft is not involved;**
 - (2) Except as otherwise provided in this subchapter, the evolved gases are not poisonous, likely to create a flammable mixture with air or be an asphyxiant under normal conditions of transportation;**
 - (3) The packaging is designed so as to preclude an unintentional release of hazardous materials from the receptacle; and**
 - (4) For shipments in bulk packagings, venting is authorized for the specific hazardous material by a special provision in the §172.101 table or by the applicable bulk packaging specification in part 178 of this subchapter.**

These requirements apply to DOT-7A, Type A packagings that are vented. The requirements are not applicable to nonvented DOT-7A, Type A packagings. Based on the design, determine if the requirements apply or do not apply. If the requirements apply, indicate below the type of documentation that shows the requirements are met and where the documentation can be found.

These requirements: Do not apply. Apply; indicate the following.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

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173.24(h) Outage and Filling Limits.

(h) Outage and filling limits—

(1) *General.* When filling packagings and receptacles for liquids, sufficient ullage (outage) must be left to ensure that neither leakage nor permanent distortion of the packaging or receptacle will occur as a result of an expansion of the liquid caused by temperatures likely to be encountered during transportation. Requirements for outage and filling limits for non-bulk and bulk packagings are specified in §§173.24a(d) and 173.24b(a), respectively.

(2) *Compressed gases and cryogenic liquids.* Filling limits for compressed gases and cryogenic liquids are specified in §§173.301 through 173.306 for cylinders and §§173.314 through 173.319 for bulk packagings.

These requirements apply to DOT-7A, Type A packagings used for the shipment of liquids and gases. The requirements are not applicable to DOT-7A, Type A packagings used to ship solids. Based on the load, indicate if the requirements apply or do not apply. If the requirements apply, indicate below the type of documentation that shows the requirements are met and where the documentation can be found.

These requirements: Do not apply. Apply; indicate the following.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

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173.24(i) Air Transportation.

(i) Air transportation. Packages offered or intended for transportation by aircraft must conform to the general requirements for transportation by aircraft in §173.27, except as provided in §171.11 of this subchapter.

This requirement applies to DOT-7A, Type A packagings when used for transportation by aircraft. Otherwise, the requirement does not apply. Based on the mode of transportation, indicate if the requirement applies or does not apply. If the requirement applies, indicate below the type of documentation that shows the requirement is met and where the documentation can be found.

This requirement: Does not apply. Applies; indicate the following.

Addressed in: Drawing Operating Instruction
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Specify:

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4.2 49 CFR 173.24a ADDITIONAL GENERAL REQUIREMENTS FOR NON-BULK PACKAGINGS AND PACKAGES.

173.24a (a) Packaging design. Except as provided in §172.312 of this subchapter:

(1) *Inner packaging closures.* A combination packaging containing liquid hazardous materials must be packed so that closures on inner packagings are upright.

This requirement applies to DOT-7A, Type A packagings that meet the definition of a combination packaging and are used to ship liquids. The requirement does not apply to packagings used to ship nonliquids. Based on the packaging type and load, indicate if the requirement applies or does not apply. If the requirement applies, indicate below the type of documentation that shows the requirement is met and where the documentation can be found.

This requirement: Does not apply. Applies; indicate the following.

Addressed in: Drawing Operating Instruction
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 Analysis Report Similarity or Documented Record

Specify:

173.24a (a) Packaging Design. (Continued)

(2) *Friction.* The nature and thickness of the outer packaging must be such that friction during transportation is not likely to generate an amount of heat sufficient to alter dangerously the chemical stability of the contents.

This requirement applies to non-bulk DOT-7A, Type A packagings. Indicate below the type of documentation that shows this requirement is met and where the documentation can be found.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

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173.24a (a) Packaging Design. (Continued)

(3) *Securing and cushioning.* Inner packagings of combination packagings must be so packed, secured and cushioned to prevent their breakage or leakage and to control their movement within the outer packaging under conditions normally incident to transportation. Cushioning material must not be capable of reacting dangerously with the contents of the inner packagings.

This requirement applies to DOT-7A, Type A packagings that meet the definition of a combination packaging. The requirement does not apply to non-combination packagings. Based on the packaging type, indicate if the requirement applies or does not apply. If the requirement applies, indicate below the type of documentation that shows the requirement is met and where the documentation can be found.

This requirement: Does not apply. Applies; indicate the following.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

173.24a (a) Packaging Design. (Continued)

(4) *Metallic devices.* Nails, staples and other metallic devices shall not protrude into the interior of the outer packaging in such a manner as to be likely to damage inner packagings or receptacles.

This requirement applies to DOT-7A, Type A packagings that use devices that could protrude into the interior of the outer packaging. Based on the packaging design, indicate if the requirement applies or does not apply. If the requirement applies, indicate below the type of documentation that shows the requirement is met and where the documentation can be found.

This requirement: Does not apply. Applies; indicate the following.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

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173.24a (a) Packaging Design. (Continued)

(5) *Vibration.* Each non-bulk package must be capable of withstanding, without rupture or leakage, the vibration test procedure specified in §178.608 of this subchapter.

This requirement applies to non-bulk DOT-7A, Type A packagings. Indicate below the type of documentation that shows this requirement is met and where the documentation can be found.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

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173.24a (b) Non-bulk Packaging Filling Limits.

- (1) A single or composite non-bulk packaging may be filled with a liquid hazardous material only when the specific gravity of the material does not exceed that marked on the packaging, or a specific gravity of 1.2 if not marked, except as follows:
 - (i) A Packing Group I packaging may be used for a Packing Group II material with a specific gravity not exceeding the greater of 1.8, or 1.5 times the specific gravity marked on the packaging, provided all the performance criteria can still be met with the higher specific gravity material;
 - (ii) A Packing Group I packaging may be used for a Packing Group III material with a specific gravity not exceeding the greater of 2.7, or 2.25 times the specific gravity marked on the packaging, provided all the performance criteria can still be met with the higher specific gravity material; and
 - (iii) A Packing Group II packaging may be used for a packing Group III material with a specific gravity not exceeding the greater of 1.8, or 1.5 times the specific gravity marked on the packaging, provided all the performance criteria can still be met with the higher specific gravity material.
- (2) Except as otherwise provided in this section, a single or composite non-bulk packaging may not be filled with a solid hazardous material to a gross mass greater than the maximum gross mass marked on the packaging.
- (3) A single or composite non-bulk packaging which is tested or marked for liquid hazardous materials may be filled with a solid hazardous material to a gross mass, in kilograms, not exceeding the rated capacity of the packaging in liters, multiplied by the specific gravity marked on the packaging, or 1.2 if not marked. In addition:
 - (i) A single or composite non-bulk packaging which is tested and marked for Packing Group I liquid hazardous materials may be filled with a solid Packing Group II hazardous material to a gross mass, in kilograms, not exceeding the rated capacity of the packaging in liters, multiplied by 1.5, multiplied by the specific gravity marked on the packaging, or 1.2 if not marked.
 - (ii) A single or composite non-bulk packaging which is tested and marked for Packing Group I liquid hazardous materials may be filled with a solid Packing Group III hazardous material to a gross mass, in kilograms, not exceeding the rated capacity of the packaging in liters, multiplied by 2.25, multiplied by the specific gravity marked on the packaging, or 1.2 if not marked.
 - (iii) A single or composite non-bulk packaging which is tested and marked for Packing Group II liquid hazardous materials may be filled with a solid Packing Group III hazardous material to a gross mass, in kilograms, not exceeding the rated capacity of the packaging in liters, multiplied by 1.5, multiplied by the specific gravity marked on the packaging, or 1.2 if not marked.
- (4) Packagings tested as prescribed in §178.605 of this subchapter and marked with the hydrostatic test pressure as prescribed in §178.503(a)(5) of this subchapter may be used for liquids only when the vapor pressure of the liquid conforms to one of the following:
 - (i) The vapor pressure must be such that the total pressure in the packaging [i.e., the vapor pressure of the liquid plus the partial pressure of air or other inert gases], less 100 kPa (15 psi) at 55° C (131° F) [determined on the basis of a maximum degree of filling in accordance with paragraph (d) of this section and a filling temperature of 15° C (59 °F)], will not exceed two-thirds of the marked test pressure;

DOT-7A, TYPE A PACKAGING QUALIFICATION CHECKLIST

173.24a(b)(4) Non-bulk Packaging Filling Limits. (Continued)

- (ii) **The vapor pressure at 50° C (122° F) must be less than four-sevenths of the sum of the marked test pressure plus 100 kPa (15 psi); or**
- (iii) **The vapor pressure at 55° C (131° F) must be less than two-thirds of the sum of the marked test pressure plus 100 kPa (15 psi).**

These requirements are not applicable to DOT-7A, Type A packagings.

1. DOT-7A, Type A packagings do not incorporate Packing Groups.
2. The maximum gross weight is not required to be marked on DOT-7A, Type A packagings by the manufacturer.
3. Packing Groups are not applicable to radioactive material.
4. 49 CFR 178.605 does not pertain to specification packagings.

173.24a (b) Non-bulk Packaging Filling Limits.

- (5) **No hazardous material may remain on the outside of a package after filling.**

For DOT-7A, Type A packagings, the requirements of 49 CFR 173.443 override this requirement. That section requires radioactive contamination on the surface of the package to be as low as reasonably achievable and establishes an upper limit for the contamination.

DOT-7A, TYPE A PACKAGING QUALIFICATION CHECKLIST

173.24a (c) Mixed Contents.

(1) An outer non-bulk packaging may contain more than one hazardous material only when--

- (i) The inner and outer packagings used for each hazardous material conform to the relevant packaging sections of this part applicable to that hazardous material;**
- (ii) The package as prepared for shipment meets the performance tests prescribed in part 178 of this subchapter for the packing group indicating the highest order of hazard for the hazardous materials contained in the package;**
- (iii) Corrosive materials (except ORM-D) in bottles are further packed in securely closed inner receptacles before packing in outer packagings; and**
- (iv) For transportation by aircraft, the total net quantity does not exceed the lowest permitted maximum net quantity per package as shown in Column 9a or 9b, as appropriate, of the §172.101 table. The permitted maximum net quantity must be calculated in kilograms if a package contains both a liquid and a solid.**

Note this requirement only applies if the package is to carry both radioactive and nonradioactive hazardous materials. Based on the load, indicate if the requirement applies or does not apply. If the requirement applies, indicate below the type of documentation that shows the requirement is met and where the documentation can be found.

This requirement: Does not apply. Applies; indicate the following.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

DOT-7A, TYPE A PACKAGING QUALIFICATION CHECKLIST

4.3 49 CFR 173.24b ADDITIONAL GENERAL REQUIREMENTS FOR BULK PACKAGINGS.

173.24b(a) Outage and Filling Limits.

- (1) Except as otherwise provided in this subchapter, liquids and liquified gases must be so loaded that the outage is at least five percent for materials poisonous by inhalation, or at least one percent of the total capacity of a cargo tank, portable tank, tank car (including dome capacity), multi-unit tank car tank, or any compartment thereof, at the following reference temperatures—
 - (i) 46°C (115°F) for a noninsulated tank;
 - (ii) 43°C (110°F) for a tank car having a thermal protection system, incorporating a metal jacket that provides an overall thermal conductance at 15.5 °C (60 °F) of no more than 10.22 kilojoules per hour per square meter per degree Celsius (0.5 Btu per hour/per square foot/per degree F) temperature differential; or
 - (iii) 41°C (105°F) for an insulated tank.
- (2) Hazardous materials may not be loaded into the dome of a tank car. If the dome of a tank car does not provide sufficient outage, vacant space must be left in the shell to provide the required outage.

These requirements are not applicable to a DOT-7A, Type A packaging unless it also meets the definition of a cargo tank; portable tank; tank car; or multi-unit tank car tank, or any compartment thereof, and is used to haul the identified liquids. Based on the packaging design, indicate if the requirements apply or do not apply. If the requirements apply, indicate below the type of documentation that shows the requirements are met and where the documentation can be found.

These requirements: Do not apply. Apply; indicate the following.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

DOT-7A, TYPE A PACKAGING QUALIFICATION CHECKLIST

173.24b (b) Stainless Steel Substitution.

(b) *Equivalent steel.* For the purposes of this section, stainless steel is steel with a guaranteed minimum tensile strength of 51.7 deka newtons per square millimeter (75,000 psi) and a guaranteed elongation of 40 percent or greater. Where the regulations permit steel other than stainless steel to be used in place of a specified stainless steel (for example, as in §172.102 of this subchapter, special provision B30), the minimum thickness for the steel must be obtained from one of the following formulas, as appropriate:

Formula for metric units:

$$e_1 = (12.74e_0) / (Rm_1A_1)^{1/3}$$

Formula for non-metric units:

$$e_1 = (144.2e_0) / (Rm_1A_1)^{1/3}$$

Where:

e_0 = Required thickness of the reference stainless steel in millimeters or inches respectively;

e_1 = Equivalent thickness of the steel used in millimeters or inches respectively;

Rm_1 = Specified minimum tensile strength of the steel used in deka newtons per square millimeter or pounds per square inch respectively; and

A_1 = Specified minimum percentage elongation of the steel used multiplied by 100 (for example, 20 percent times 100 equals 20). Elongation values used must be determined from a 50 mm or 2 inch test specimen.

This requirement is not applicable to DOT-7A, Type A packagings as no specific materials of construction are identified for the packaging.

DOT-7A, TYPE A PACKAGING QUALIFICATION CHECKLIST

173.24b (c) Pressurized Loading:

(c) Air pressure in excess of ambient atmospheric pressure may not be used to load or unload any lading which may create an air-enriched mixture within the flammability range of the lading in the vapor space of the tank.

This requirement applies to DOT-7A, Type A packagings that meet the definition of bulk packaging. Based on the packaging design and load, indicate if the requirement applies or does not apply. If the requirement applies, indicate below the type of documentation that shows the requirement is met and where the documentation can be found.

This requirement: Does not apply. Applies; indicate the following.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

173.24b (d) Design Temperature Range/Weight:

(d) A bulk packaging may not be loaded with a hazardous material that:
(1) Is at a temperature outside of the packaging's design temperature range; or
(2) Except as otherwise provided in this subchapter, exceeds the maximum weight of lading marked on the specification plate.

This requirement applies to a DOT-7A, Type A packaging that also meets the definition of a bulk packaging. Based on the packaging design, indicate if the requirement applies or does not apply. If the requirement applies, indicate below the type of documentation that shows the requirement is met and where the documentation can be found.

This requirement: Does not apply. Applies; indicate the following.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

DOT-7A, TYPE A PACKAGING QUALIFICATION CHECKLIST

4.4 49 CFR 173.27 GENERAL REQUIREMENTS FOR TRANSPORTATION BY AIRCRAFT.

173.27(a) Transport by Aircraft.

(a) The requirements of this section are in addition to the requirements in §173.24 and apply to packages offered or intended for transportation aboard aircraft. Notwithstanding any Packing Group III performance level specified in Column 5 of the §172.101 table, the required performance level for packages containing Class 4, 5, or 8 materials, when offered or intended for transportation aboard aircraft, is at the Packing Group II performance level, unless otherwise excepted from performance requirements in Subpart E of this part.

This requirement is applicable to DOT-7A, Type A packagings when transported by aircraft. Based on the mode of transportation, indicate if the requirement applies or does not apply. If the requirement applies, indicate below the type of documentation that shows the requirement is met and where the documentation can be found.

This requirement: Does not apply. Applies; indicate the following.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

DOT-7A, TYPE A PACKAGING QUALIFICATION CHECKLIST

173.27(b) Transport by Aircraft.

(b) Packages authorized on board aircraft.

(1) When Column 9a of the §172.101 table indicates that a material is "Forbidden", that material may not be offered for transportation or transported aboard passenger-carrying aircraft.

(2) When Column 9b of the §172.101 table indicates that a material is "Forbidden", that material may not be offered for transportation or transported aboard aircraft.

(3) The maximum quantity of hazardous material in a package that may be offered for transportation or transported aboard a passenger-carrying aircraft or cargo aircraft may not exceed that quantity prescribed for the material in Column 9a or 9b, respectively, of the §172.101 table.

(4) A package containing a hazardous material which is authorized aboard cargo aircraft but not aboard passenger aircraft must be labeled with the CARGO AIRCRAFT ONLY label required by §172.402(b) of this subchapter and may not be offered for transportation or transported aboard passenger-carrying aircraft.

These requirements are applicable to DOT-7A, Type A packagings when transported by aircraft. Based on the mode of transportation, indicate if the requirements apply or do not apply. If the requirements apply, indicate below the type of documentation that shows the requirements are met and where the documentation can be found.

This requirement: Does not apply. Applies; indicate the following.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

DOT-7A, TYPE A PACKAGING QUALIFICATION CHECKLIST

173.27(c) Transport by Aircraft.

(c) Pressure requirements. (1) Packagings must be designed and constructed to prevent leakage that may be caused by changes in altitude and temperature during transportation aboard aircraft.

This requirement is applicable to DOT-7A, Type A packagings when transported by aircraft. Based on the mode of transportation, indicate if the requirement applies or does not apply. If the requirement applies, indicate below the type of documentation that shows the requirement is met and where the documentation can be found.

This requirement: Does not apply. Applies; indicate the following.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

DOT-7A, TYPE A PACKAGING QUALIFICATION CHECKLIST

173.27(c) Transport by Aircraft. (Continued)

- (2) Packagings for which retention of liquid is a basic function must be capable of withstanding without leakage the greater of--**
- (i) An internal pressure which produces a gauge pressure of not less than 75 kPa (11 psi) for liquids in Packing Group III of Class 3 or Division 6.1 or 95 kPa (14 psi) for other liquids; or**
 - (ii) A pressure related to the vapor pressure of the liquid to be conveyed, determined by one of the following:**
 - (A) The total gauge pressure measured in the receptacle [i.e., the vapor pressure of the material and the partial pressure of air or other inert gases, less 100 kPa (15 psi) at 55°C (131°F)], multiplied by a safety factor of 1.5; determined on the basis of a filling temperature of 15°C (59 °F) and a degree of filling such that the receptacle is not completely liquid full at a temperature of 55°C (131°F) or less;**
 - (B) 1.75 times the vapor pressure at 50°C (122°F) less 100 kPa (15 psi); or**
 - (C) 1.5 times the vapor pressure at 55°C (131°) less 100 kPa (15 psi).**

This requirement is applicable to a DOT-7A, Type A packaging when it is transported by aircraft and contains liquids. Based on the mode of transportation and content, indicate below if the requirement applies or does not apply. If the requirement applies, indicate the type of documentation that shows the requirement is met and where the documentation can be found.

This requirement: Does not apply. Applies; indicate the following.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

DOT-7A, TYPE A PACKAGING QUALIFICATION CHECKLIST

173.27(c) Transport by Aircraft. (Continued)

- (3) Notwithstanding the provisions of paragraph (c)(2) of this section--**
 - (i) Hazardous materials may be contained in an inner packaging which does not itself meet the pressure requirement provided that the inner packaging is packed within a supplementary packaging which does meet the pressure requirement and other applicable packaging requirements of this subchapter.**
 - (ii) Packagings which are subject to the hydrostatic pressure test and marking requirements of §178.605 and §178.503(a)(5), respectively, of this subchapter must have a marked test pressure of not less than 250 kPa (36 psi) for liquids in Packing Group I, 80 kPa (12 psi) for liquids in Packing Group III of Class 3 or Division 6.1, and 100 kPa (15 psi) for other liquids.**

These requirements are not applicable to DOT-7A, Type A packagings.

The first part clarifies that the packaging holding the load does not have to provide the pressure boundary. The second part is not applicable to DOT-7A, Type A packagings as they are not subject to sections 49 CFR 178.605 or 178.503(a)(5) of the regulations.

173.27(d) Transport by Aircraft.

(d) Closures. Stoppers, corks or other such friction-type closures must be held securely, tightly and effectively in place by positive means. Each screw-type closure on any packaging must be secured to prevent closure from loosening due to vibration or substantial change in temperature.

This requirement is applicable to DOT-7A, Type A packagings when transported by aircraft. Based on the mode of transportation, indicate below if the requirement applies or does not apply. If the requirement applies, indicate the type of documentation that shows the requirement is met and where the documentation can be found.

- This requirement: Does not apply. Applies; indicate the following.
- Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

DOT-7A, TYPE A PACKAGING QUALIFICATION CHECKLIST

173.27(e) Transport by Aircraft.

(e) Absorbent materials. Except as otherwise provided in this subchapter, liquids in Packing Group I or II of Class 3, 4, 5, 6, or 8, when in glass or earthenware inner packagings, must be packaged using material capable of absorbing and not likely to react dangerously with the liquid. Absorbent material is not required if the inner packagings are so protected that breakage of them and leakage of their contents from the outer packaging is not likely to occur under normal conditions of transportation and is not required for packagings containing liquids in Packing Group II for transport aboard cargo aircraft only. Where absorbent material is required and an outer packaging is not liquid-tight, a means of containing the liquid in the event of leakage must be used in the form of a leakproof liner, plastic bag or other equally efficient means of containment. Where absorbent material is required, the quantity and disposition of it in each outer packaging must be as follows:

- (1) For packagings containing liquids in Packing Group I offered for transportation or transported aboard passenger-carrying aircraft, each packaging must contain sufficient absorbent material to absorb the contents of all inner packagings containing such liquids;
- (2) For packagings containing liquids in Packing Group I offered for transportation or transported aboard cargo aircraft only and packagings containing liquids in Packing Group II offered for transportation or transported aboard passenger aircraft, each package must contain sufficient absorbent material to absorb the contents of any one of the inner packagings containing such liquids and, where they are of different sizes and quantities, sufficient absorbent material to absorb the contents of the inner packaging containing the greatest quantity of liquid.

These requirements are not applicable to DOT-7A, Type A packagings.

DOT-7A, Type A packagings are for transport of Class 7 (radioactive) materials.

173.27(f) Transport by Aircraft.

(f) Combination packagings. Unless otherwise specified in this part, or in §171.11 of this subchapter, when combination packagings are offered for transportation aboard aircraft, inner packagings must conform to the quantity limitations set forth in Table 1 of this paragraph for transport aboard passenger-carrying aircraft and Table 2 of this paragraph for transport aboard cargo aircraft only, as follows: ...

These requirements are not applicable to DOT-7A, Type A packagings.

DOT-7A, Type A packagings are for transport of Class 7 (radioactive) materials.

DOT-7A, TYPE A PACKAGING QUALIFICATION CHECKLIST

173.27(g) Transport by Aircraft.

(g) Cylinders. For any cylinder containing hazardous materials and incorporating valves, sufficient protection must be provided to prevent operation of, and damage to, the valves during transportation, by one of the following methods:

- (1) By equipping each cylinder with securely attached valve caps or protective head rings; or**
- (2) By boxing or crating the cylinder.**

This requirement is not applicable to a DOT-7A, Type A packaging unless it is a cylinder equipped with a valve(s) and is to be transported by aircraft. Based on the mode of transportation and packaging type, indicate below if the requirement applies or does not apply. If the requirement applies, indicate below the type of documentation that shows the requirement is met and where the documentation can be found.

This requirement: Does not apply. Applies; indicate the following.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

173.27(h) Transport by Aircraft.

(h) Tank cars and cargo tanks. Any tank car or cargo tank containing a hazardous material may not be transported aboard aircraft.

This requirement is not applicable to a DOT-7A, Type A packaging unless it is a tank car or cargo tank and is to be transported by aircraft. Based on the mode of transportation and packaging type, indicate below if the requirement applies or does not apply. If the requirement applies, indicate below the type of documentation that shows the requirement is met and where the documentation can be found.

This requirement: Does not apply. Applies; indicate the following.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

DOT-7A, TYPE A PACKAGING QUALIFICATION CHECKLIST

4.5 49 CFR 173.410 GENERAL DESIGN REQUIREMENTS.

173.410(a) Handling and Securing.

In addition to the requirements of subparts A and B of this part, each package used for the shipment of Class 7 (radioactive) materials must be designed so that—

- (a) The package can be easily handled and properly secured in or on a conveyance during transport.

This requirement applies to DOT-7A, Type A packagings. Indicate below the type of documentation that shows this requirement is met and where the documentation can be found.

- Addressed in:
- | | |
|--|--|
| <input type="checkbox"/> Drawing | <input type="checkbox"/> Operating Instruction |
| <input type="checkbox"/> Specification | <input type="checkbox"/> Manufacturer Supplied Data |
| <input type="checkbox"/> Analysis Report | <input type="checkbox"/> Similarity or Documented Record |

Specify:

173.410(b) Lifting Attachments.

(b) Each lifting attachment that is a structural part of the package must be designed with a minimum safety factor of three against yielding when used to lift the package in the intended manner, and it must be designed so that failure of any lifting attachment under excessive load would not impair the ability of the package to meet other requirements of this subpart. Any other structural part of the package which could be used to lift the package must be capable of being rendered inoperable for lifting the package during transport or must be designed with strength equivalent to that required for lifting attachments.

These requirements apply to DOT-7A, Type A packagings. Indicate below the type of documentation that shows these requirements are met and where the documentation can be found.

- Addressed in:
- | | |
|--|--|
| <input type="checkbox"/> Drawing | <input type="checkbox"/> Operating Instruction |
| <input type="checkbox"/> Specification | <input type="checkbox"/> Manufacturer Supplied Data |
| <input type="checkbox"/> Analysis Report | <input type="checkbox"/> Similarity or Documented Record |

Specify:

DOT-7A, TYPE A PACKAGING QUALIFICATION CHECKLIST

173.410(c) External Surface Protrusions, Decontamination.

(c) The external surface, as far as practicable, will be free from protruding features and will be easily decontaminated.

This requirement applies to DOT-7A, Type A packagings. Indicate below the type of documentation that shows this requirement is met and where the documentation can be found.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

173.410(d) Outer Layer - Pockets, Crevices (Water Collection).

(d) The outer layer of packaging will avoid, as far as practicable, pockets or crevices where water might collect.

This requirement applies to DOT-7A, Type A packagings. Indicate below the type of documentation that shows this requirement is met and where the documentation can be found.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

DOT-7A, TYPE A PACKAGING QUALIFICATION CHECKLIST

173.410(e) Features Added at Time of Transport.

(e) Each feature that is added to the package will not reduce the safety of the package.

This requirement applies to DOT-7A, Type A packagings that have features added at the time of shipment. Based on the packaging design, indicate below if the requirement applies or does not apply. If the requirement applies, indicate the type of documentation that shows this requirement is met and where the documentation can be found.

This requirement: Does not apply. Applies; indicate the following.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

173.410(f) Acceleration, Vibration.

(f) The package will be capable of withstanding the effects of any acceleration, vibration or vibration resonance that may arise under normal conditions of transport without any deterioration in the effectiveness of the closing devices on the various receptacles or in the integrity of the package as a whole and without loosening or unintentionally releasing the nuts, bolts, or other securing devices even after repeated use (see §§173.24, 173.24a, and 173.24b).

These requirements apply to DOT-7A, Type A packagings. Indicate below the type of documentation that shows these requirements are met and where the documentation can be found.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

DOT-7A, TYPE A PACKAGING QUALIFICATION CHECKLIST

173.410(g) Physical/Chemical Compatibility, Irradiation.

(g) The materials of construction of the packaging and any components or structure will be physically and chemically compatible with each other and with the package contents. The behavior of the packaging and the package contents under irradiation will be taken into account.

This requirement applies to DOT-7A, Type A packagings. Indicate below the type of documentation that shows this requirement is met and where the documentation can be found.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

173.410(h) Valves – Protection, Enclosure.

(h) All valves through which the package contents could escape will be protected against unauthorized operation.

This requirement applies to DOT-7A, Type A packagings that have valves. Based on the packaging design, determine if the requirement applies or does not apply. If the requirement applies, identify the type of documentation that shows this requirement is met and where the documentation can be found.

This requirement: Does not apply. Applies; indicate the following.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

DOT-7A, TYPE A PACKAGING QUALIFICATION CHECKLIST

173.410(i) For Transport by Air--

(i) For transport by air---

- (1) The temperature of the accessible surfaces of the package will not exceed 50°C (122°F) at an ambient temperature of 38°C (100°F) with no account taken for insulation;**
- (2) The integrity of containment will not be impaired if the package is exposed to ambient temperatures ranging from -40°C (-40°F) to +55°C (131°F); and**
- (3) Packages containing liquid contents will be capable of withstanding, without leakage, an internal pressure that produces a pressure differential of not less than 95 kPa (13.8 lb/in²).**

These requirements apply to DOT-7A, Type A packagings used for transport by aircraft. Based on the mode of transportation, indicate below if the requirements apply or do not apply. If the requirements apply, identify the type of documentation that shows these requirements are met and where the documentation can be found.

These requirements: Do not apply. Apply; indicate the following.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

DOT-7A, TYPE A PACKAGING QUALIFICATION CHECKLIST

4.6 49 CFR 173.412 ADDITIONAL DESIGN REQUIREMENTS FOR TYPE A PACKAGES.

173.412 Tamper Indication.

In addition to meeting the general design requirements prescribed in §173.410, each Type A packaging must be designed so that--

- (a) The outside of the packaging incorporates a feature, such as a seal, that is not readily breakable, and that, while intact, is evidence that the package has not been opened. In the case of packages shipped in closed transport vehicles in exclusive use, the cargo compartment, instead of the individual packages, may be sealed.**

This requirement applies to DOT-7A, Type A packagings. Indicate below the type of documentation that shows this requirement is met and where the documentation can be found.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

173.412(b) Smallest External Dimension.

- (b) The smallest external dimension of the package is not less than 10 centimeters (4 inches);**

This requirement applies to DOT-7A, Type A packagings. Indicate below the type of documentation that shows this requirement is met and where the documentation can be found.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

DOT-7A, TYPE A PACKAGING QUALIFICATION CHECKLIST

173.412(c) Containment and Shielding.

(c) Containment and shielding is maintained during transportation and storage in a temperature range of -40°C (-40°F) to 70°C (158°F). Special attention shall be given to liquid contents and to the potential degradation of the packaging materials within the temperature range.

This requirement applies to DOT-7A, Type A packagings. Indicate below the type of documentation that shows this requirement is met and where the documentation can be found.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

173.412(d) Secure Containment System.

(d) The packaging must include a containment system securely closed by a positive fastening device that cannot be opened unintentionally or by pressure that may arise within the package during normal transport. Special form Class 7 (radioactive) material, as demonstrated in accordance with §173.469, may be considered as a component of the containment system. If the containment system forms a separate unit of the package, it must be securely closed by a positive fastening device that is independent of any other part of the package.

This requirement applies to DOT-7A, Type A packagings. Indicate below the type of documentation that shows this requirement is met and where the documentation can be found.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

DOT-7A, TYPE A PACKAGING QUALIFICATION CHECKLIST

173.412(e) Radiolytic Decomposition, Chemical Reaction, Radiolysis.

(e) For each component of the containment system account is taken, where applicable, of radiolytic decomposition of materials and the generation of gas by chemical reaction and radiolysis.

This requirement applies to DOT-7A, Type A packagings. Indicate below the type of documentation that shows this requirement is met and where the documentation can be found.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

173.412(f) Reduction of Ambient Pressure.

(f) The containment system will retain its radioactive contents under the reduction of ambient pressure to 25 kPa (3.6 pounds per square inch).

This requirement applies to DOT-7A, Type A packagings. Indicate below the type of documentation that shows this requirement is met and where the documentation can be found.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

DOT-7A, TYPE A PACKAGING QUALIFICATION CHECKLIST

173.412(g) Valve - Protection, Enclosure.

(g) Each valve, other than a pressure relief device, is provided with an enclosure to retain any leakage.

This requirement applies to DOT-7A, Type A packagings. Indicate below the type of documentation that shows this requirement is met and where the documentation can be found.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

173.412(h) Shielding (Enclosure).

(h) Any radiation shield that encloses a component of the packaging specified as part of the containment system will prevent the unintentional escape of that component from the shield.

This requirement applies to DOT-7A, Type A packagings. Indicate below the type of documentation that shows this requirement is met and where the documentation can be found.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

DOT-7A, TYPE A PACKAGING QUALIFICATION CHECKLIST

173.412(i) Tiedown (Failure).

(i) Failure of any tie-down attachment that is a structural part of the packaging, under both normal and accident conditions, must not impair the ability of the package to meet other requirements of this subpart.

This requirement applies to DOT-7A, Type A packagings. Indicate below the type of documentation that shows this requirement is met and where the documentation can be found.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

173.412(j) Evaluation and Testing.

(j) When evaluated against the performance requirements of this section and the tests specified in §173.465 or using any of the methods authorized by §173.461(a), the packaging will prevent--

- (1) Loss or dispersal of the radioactive contents; and**
- (2) A significant increase in the radiation levels recorded or calculated at the external surfaces for the condition before the test.**

NOTE: A significant increase may be defined as, "Loss of shielding integrity which would result in more than a 20 percent increase in the radiation level at any external surface of the package" (IAEA 1996, para. 646).

This requirement applies to DOT-7A, Type A packagings. Indicate below the type of documentation that shows this requirement is met and where the documentation can be found.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

DOT-7A, TYPE A PACKAGING QUALIFICATION CHECKLIST

173.412(k) Design Requirement for Liquid Packagings.

(k) Each packaging designed for liquids will--

(1) Be designed to provide for ullage to accommodate variations in temperature of the contents, dynamic effects and filling dynamics;

This requirement applies to DOT-7A, Type A packagings for use in transporting liquids. Based on the packaging design, indicate below if the requirement applies or not. If the requirement applies, identify the type of documentation that shows this requirement is met and where the documentation can be found.

This requirement: Does not apply. Applies; indicate the following.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

173.412(k)(2) Evaluation and Testing of Liquid Packagings.

(2) Meet the conditions prescribed in paragraph (j) of this section when subjected to the tests specified in §173.466 or evaluated against these tests by any of the methods authorized by §173.461(a); and

This requirement applies to DOT-7A, Type A packagings for use in transporting liquids. Based on the packaging design, indicate below if the requirement applies or not. If the requirement applies, identify the type of documentation that shows this requirement is met and where the documentation can be found.

This requirement: Does not apply. Applies; indicate the following.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

DOT-7A, TYPE A PACKAGING QUALIFICATION CHECKLIST

173.412(k)(3) Choice of Design Requirement for Liquid Packagings.

(3) Either--

- (i) Have sufficient suitable absorbent material to absorb twice the volume of the liquid contents. The absorbent material must be compatible with the package contents and suitably positioned to contact the liquid in the event of leakage; or**
- (ii) Have a containment system composed of primary inner and secondary outer containment components designed to assure retention of the liquid contents within the secondary outer component in the event that the primary inner component leaks.**

This requirement applies to DOT-7A, Type A packagings for use in transporting liquids. Based on the packaging design, indicate below if the requirement applies or not. If the requirement applies, identify the type of documentation that shows this requirement is met and where the documentation can be found.

This requirement: Does not apply. Applies; indicate the following.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

173.412(l) Evaluation and Testing of Gas Packagings.

- (l) Each packaging designed for gases, other than tritium not exceeding 40 TBq (1000 Ci) or noble gases not exceeding the A2 value appropriate for the noble gas, will be able to prevent loss or dispersal of contents when the package is subjected to the tests prescribed in §173.466 or evaluated against these tests by any of the methods authorized by §173.461(a).**

This requirement applies to DOT-7A, Type A packagings for use in transporting gases. Based on the packaging design, indicate below if the requirement applies or not. If the requirement applies, identify the type of documentation that shows this requirement is met and where the documentation can be found.

This requirement: Does not apply. Applies; indicate the following.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

DOT-7A, TYPE A PACKAGING QUALIFICATION CHECKLIST

4.7 49 CFR 173.465 TYPE A PACKAGING TESTS.

173.465(a) Packaging Tests.

(a) The packaging, with contents, must be capable of withstanding the water spray, free drop, stacking and penetration tests prescribed in this section. One prototype may be used for all tests if the requirements of paragraph (b) of this section are met.

This requirement applies to DOT-7A, Type A packagings. Indicate below the type of documentation that shows this requirement is met and where the documentation can be found.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

173.465(b) Water Spray.

(b) *Water spray test.* The water spray test must precede each test or test sequence prescribed in this section. The water spray test must simulate exposure to rainfall of approximately 5 centimeters (2 inches) per hour for at least one hour. The time interval between the end of the water spray test and the beginning of the next test must be such that the water has soaked in to the maximum extent without appreciable drying of the exterior of the specimen. In the absence of evidence to the contrary, this interval may be assumed be two hours if the water spray is applied from four different directions simultaneously. However, no time interval may elapse if the water spray is applied from each of the four directions consecutively.

This requirement applies to DOT-7A, Type A packagings. Indicate below the type of documentation that shows this requirement is met and where the documentation can be found.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

DOT-7A, TYPE A PACKAGING QUALIFICATION CHECKLIST

173.465(c) Free Drop.

(c) Free drop test. The specimen must drop onto the target so as to suffer maximum damage to the safety features being tested, and:

This requirement applies to DOT-7A, Type A packagings. Indicate below the type of documentation that shows this requirement is met and where the documentation can be found.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

173.465(c)(1) Free Drop.

(1) The height of the drop measured from the lowest point of the specimen to the upper surface of the target may not be less than the distance specified in Table 12, for the applicable package mass. The target must be as specified in §173.465(c)(5). Table 12 is as follows:

Table 12.--Free Drop Distance for testing Packages to Normal Conditions of Transport	
Packaging mass kilograms (pounds)	Free drop distance Meters (feet)
< mass 5000 (11,000)	1.2 (4)
5000 (11000) mass to 10,000 (22,000)	0.9 (3)
10,000 (22,000) mass to 15,000 (33,000)	0.6 (2)
> 15,000 (33,000) mass	0.3 (1)

This requirement applies to DOT-7A, Type A packagings. Indicate below the type of documentation that shows this requirement is met and where the documentation can be found.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

DOT-7A, TYPE A PACKAGING QUALIFICATION CHECKLIST

173.465(c)(2) Free Drop.

(2) For packages containing fissile material, the free drop test specified in paragraph (c)(1) of this section must be preceded by a free drop from a height of 0.3 meter (1 foot) on each corner, or in the case of cylindrical packages, onto each of the quarters of each rim.

This requirement applies to DOT-7A, Type A packagings for use in transporting fissile material. Based on the load, indicate below if the requirement applies or not. If the requirement applies, identify the type of documentation that shows this requirement is met and where the documentation can be found.

This requirement: Does not apply. Applies; indicate the following.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

173.465(c)(3) Free Drop.

(3) For fiberboard or wood rectangular package with a mass of 50 kilograms (110 pounds) or less, a separate specimen must be subjected to a free drop onto each corner from a height of 0.3 meter (1 foot).

This requirement applies to rectangular DOT-7A, Type A packagings constructed of fiberboard or wood that have a gross weight of 50 kilograms (110 pounds) or less. Based on the materials of construction and the gross weight of the package, indicate below if the requirement applies or not. If the requirement applies, identify the type of documentation that shows this requirement is met and where the documentation can be found.

This requirement: Does not apply. Applies; indicate the following.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

DOT-7A, TYPE A PACKAGING QUALIFICATION CHECKLIST

173.465(c)(4) Free Drop.

(4) For cylindrical fiberboard packages with a mass of 100 kilograms (220 pounds) or less, a separate specimen must be subjected to a free drop onto each of the quarters of each rim from a height of 0.3 meter (1 foot).

This requirement applies to cylindrical DOT-7A, Type A packagings constructed of fiberboard having a gross weight of 100 kilograms (220 pounds) or less. Based on the shape and the gross weight of the package, indicate below if the requirement applies or not. If the requirement applies, identify the type of documentation that shows this requirement is met and where the documentation can be found.

This requirement: Does not apply. Applies; indicate the following.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

173.465(c)(5) Free Drop.

(5) The target for the free drop test must be a flat, horizontal surface of such mass and rigidity that any increase in its resistance to displacement or deformation upon impact by the specimen would not significantly increase the damage to the specimen.

This requirement applies to DOT-7A, Type A packagings. Indicate below the type of documentation that shows this requirement is met and where the documentation can be found.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

DOT-7A, TYPE A PACKAGING QUALIFICATION CHECKLIST

173.465(d) Stacking Test.

(d) *Stacking test.*

- (1) The specimen must be subjected for a period of at least 24 hours to a compressive load equivalent to the greater of the following:**
 - (i) Five times the mass of the actual package; or**
 - (ii) The equivalent of 13 kilopascals (1.9 pounds per square inch) multiplied by the vertically projected area of the package.**
- (2) The compressive load must be applied uniformly to two opposite sides of the specimen, one of which must be the base on which the package would normally rest.**

This requirement applies to DOT-7A, Type A packagings. Indicate below the type of documentation that shows this requirement is met and where the documentation can be found.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

DOT-7A, TYPE A PACKAGING QUALIFICATION CHECKLIST

4.8 49 CFR 173.466 ADDITIONAL TESTS FOR TYPE A PACKAGING DESIGNED FOR LIQUIDS AND GASES.

173.466(a) Additional Tests.

(a) In addition to the tests prescribed in §173.465, Type A packagings designed for liquids and gases must be capable of withstanding the following tests:

- (1) *Free drop test.* The packaging specimen must drop onto the target so as to suffer the maximum damage to its containment. The height of the drop measured from the lowest part of the packaging specimen to the upper surface of the target must be 9 meters (30 feet) or greater. The target must be as specified in §173.465(c)(5).
- (2) *Penetration test.* The specimen must be subjected to the test specified in §173.465(e) except that the height of the drop must be 1.7 meters (5.5 feet).

This requirement applies only to DOT-7A, Type A packagings used to transport liquids or gases. Based on the contents of the package, indicate below if the requirement applies or not. If the requirement applies, identify the type of documentation that shows this requirement is met and where the documentation can be found.

This requirement: Does not apply. Applies; indicate the following.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

DOT-7A, TYPE A PACKAGING QUALIFICATION CHECKLIST

173.462(c) Identify Containment System.

(c) The containment system of the packaging must be clearly specified.

This requirement applies to DOT-7A, Type A packagings. Indicate below the type of documentation that shows this requirement is met and where the documentation can be found.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

173.462(d) Identify External Features.

(d) The external features of the specimen must be clearly identified so that reference may be made to any part of it.

This requirement applies to DOT-7A, Type A packagings. Indicate below the type of documentation that shows this requirement is met and where the documentation can be found.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

DOT-7A, TYPE A PACKAGING QUALIFICATION CHECKLIST

6.0 MANUFACTURER'S COMMUNICATIONS

49 CFR 178.2(c) Notification.

(c) Notification. Except as specifically provided in §§178.337-18 and 178.345-10 of this part, the manufacturer or other person certifying compliance with the requirements of this part, and each subsequent distributor of that packaging shall--

- (1) Notify in writing each person to whom that packaging is transferred--**
 - (i) Of all requirements in this part not met at the time of transfer, and**
 - (ii) Of the type and dimensions of any closures, including gaskets, needed to satisfy performance test requirements.**
- (2) Retain copies of each written notification for at least one year from date of issuance; and**
- (3) Make copies of all written notifications available for inspection by a representative of the Department.**

These requirements apply to DOT-7A, Type A packagings. Indicate below the type of documentation that shows these requirements are met and where the documentation can be found.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record

Specify:

DOT-7A, TYPE A PACKAGING QUALIFICATION CHECKLIST

7.0 49 CFR 178.3 MARKING OF PACKAGINGS

178.3(a) What and How to Mark.

(a) Each packaging represented as manufactured to a DOT specification or a UN Standard must be marked with specification markings conforming to the applicable specification, and with the following:

- (1) In an unobstructed area, with letters, and numerals identifying the standards or specification (e.g., UN 1A1, DOT 4B240ET, etc.).
- (2) Unless otherwise specified in this part, with the name and address or symbol of the packaging manufacturer or, where specifically authorized, the symbol of the approval agency certifying compliance with a UN standard. Symbols, if used, must be registered with the Associate Administrator for Hazardous Materials Safety. Duplicative symbols are not authorized.
- (3) The markings must be stamped, embossed, burned, printed or otherwise marked on the packaging to provide adequate accessibility, permanency, contrast, and legibility so as to be readily apparent and understood.
- (4) Unless otherwise specified, letters and numerals must be at least 12.0 mm (0.47 inches) in height except that for packagings of less than or equal to 30 L (7.9 gallons) capacity for liquids or 30 kg (66 pounds) capacity for solids the height must be at least 6.0 mm (0.2 inches). For packagings having a capacity of 5 L (1 gallon) or 5 kg (11 pounds) or less, letters and numerals must be of an appropriate size.
- (5) For packages with a gross mass of more than 30 kg (66 pounds), the markings or a duplicate thereof must appear on the top or on a side of the packaging.

These requirements apply to DOT-7A, Type A packagings. Indicate below the type of documentation that shows these requirements are met and where the documentation can be found.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record
 Packaging

Specify:

DOT-7A, TYPE A PACKAGING QUALIFICATION CHECKLIST

178.3(b) Marking.

(b) A UN standard packaging for which the UN standard is set forth in this part may be marked with the United Nations symbol and other specification markings only if it fully conforms to the requirements of this part. A UN standard packaging for which the UN standard is not set forth in this part may be marked with the United Nations symbol and other specification markings for that standard as provided in the ICAO Technical Instructions or Annex 1 of the IMDG Code subject to the following conditions:

- (1) The U.S. manufacturer must establish that the packaging conforms to the applicable provisions of the ICAO Technical Instructions or Annex 1 of the IMDG Code, respectively.**
- (2) If an indication of the name of the manufacturer or other identification of the packaging as specified by the competent authority is required, the name and address or symbol of the manufacturer or the approval agency certifying compliance with the UN standard must be entered. Symbols, if used, must be registered with the Associate Administrator for Hazardous Materials Safety.**
- (3) The letters "USA" must be used to indicate the State authorizing the allocation of the specification marks if the packaging is manufactured in the United States.**

These requirements apply to DOT-7A, Type A packagings. Indicate below the type of documentation that shows these requirements are met and where the documentation can be found.

Addressed in: Drawing Operating Instruction
 Specification Manufacturer Supplied Data
 Analysis Report Similarity or Documented Record
 Packaging

Specify:

DOT-7A, TYPE A PACKAGING QUALIFICATION CHECKLIST

8.0 REFERENCES

49 CFR 173, "Shippers--General Requirements for Shipments and Packagings, *Code of Federal Regulations*, as amended.

49 CFR 178, "Specifications for Packagings," *Code of Federal Regulations*, as amended.

IAEA, 1990, *Regulations for the Safe Transport of Radioactive Material, 1995 Edition*, Safety Series No. 6, as amended 1990) International Atomic Energy Agency, Vienna, Austria.

IAEA, 1996, *Regulations for the Safe Transport of Radioactive Material, Requirements No. ST-1, 1996 Edition*, International Atomic Energy Agency, Vienna, Austria.