

(1) Section 71.74 (“Accident conditions for air transport of plutonium”)—

(i) The containment vessel would not be ruptured in its post-tested condition, and the package must provide a sufficient degree of containment to restrict accumulated loss of plutonium contents to not more than an A<sub>2</sub> quantity in a period of 1 week;

(ii) The external radiation level would not exceed 10 mSv/h (1 rem/h) at a distance of 1 m (40 in) from the surface of the package in its post-tested condition in air; and

(iii) A single package and an array of packages are demonstrated to be subcritical in accordance with this part, except that the damaged condition of the package must be considered to be that which results from the plutonium accident tests in § 71.74, rather than the hypothetical accident tests in § 71.73; and

(2) Section 71.74(c), there would be no detectable leakage of water into the containment vessel of the package.

(b) With respect to the package requirements of paragraph (a), there must be a demonstration or analytical assessment showing that—

(1) The results of the physical testing for package qualification would not be adversely affected to a significant extent by—

(i) The presence, during the tests, of the actual contents that will be transported in the package; and

(ii) Ambient water temperatures ranging from 0.6 °C (+33 °F) to 38 °C (+100 °F) for those qualification tests involving water, and ambient atmospheric temperatures ranging from −40 °C (−40 °F) to +54 °C (+130 °F) for the other qualification tests.

(2) The ability of the package to meet the acceptance standards prescribed for the accident condition sequential tests would not be adversely affected if one or more tests in the sequence were deleted.

#### § 71.65 Additional requirements.

The Commission may, by rule, regulation, or order, impose requirements on any licensee, in addition to those established in this part, as it deems necessary or appropriate to protect public health or to minimize danger to life or property.

### Subpart F—Package, Special Form, and LSA-III Tests<sup>2</sup>

#### § 71.71 Normal conditions of transport.

(a) *Evaluation.* Evaluation of each package design under normal conditions of transport must include a determination of the effect on that design of the conditions and tests specified in this section. Separate specimens may be used for the free drop test, the compression test, and the penetration test, if each specimen is subjected to the water spray test before being subjected to any of the other tests.

(b) *Initial conditions.* With respect to the initial conditions for the tests in this section, the demonstration of compliance with the requirements of this part must be based on the ambient temperature preceding and following the tests remaining constant at that value between −29 °C (−20 °F) and +38 °C (+100 °F) which is most unfavorable for the feature under consideration. The initial internal pressure within the containment system must be considered to be the maximum normal operating pressure, unless a lower internal pressure consistent with the ambient temperature considered to precede and follow the tests is more unfavorable.

(c) *Conditions and tests*—(1) *Heat.* An ambient temperature of 38 °C (100 °F) in still air, and insolation according to the following table:

INSOLATION DATA	
Form and location of surface	Total insolation for a 12-hour period (g cal/cm <sup>2</sup> )
Flat surfaces transported horizontally:	
Base .....	None
Other surfaces .....	800
Flat surfaces not transported horizontally ..	200
Curved surfaces .....	400

(2) *Cold.* An ambient temperature of −40 °C (−40 °F) in still air and shade.

(3) *Reduced external pressure.* An external pressure of 25 kPa (3.5 lbf/in<sup>2</sup>) absolute.

(4) *Increased external pressure.* An external pressure of 140 kPa (20 lbf/in<sup>2</sup>) absolute.

<sup>2</sup>The package standards related to the tests in this subpart are contained in subpart E of this part.

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(5) *Vibration*. Vibration normally incident to transport.

(6) *Water spray*. A water spray that simulates exposure to rainfall of approximately 5 cm/h (2 in/h) for at least 1 hour.

(7) *Free drop*. Between 1.5 and 2.5 hours after the conclusion of the water spray test, a free drop through the distance specified below onto a flat, essentially unyielding, horizontal surface, striking the surface in a position for which maximum damage is expected.

### CRITERIA FOR FREE DROP TEST (WEIGHT/DISTANCE)

Package weight		Free drop distance	
Kilograms	(Pounds)	Meters	(Feet)
Less than 5,000 .....	(Less than 11,000)	1.2	(4)
5,000 to 10,000 .....	(11,000 to 22,000)	0.9	(3)
10,000 to 15,000 ...	(22,000 to 33,100)	0.6	(2)
More than 15,000 ..	(More than 33,100)	0.3	(1)

(8) *Corner drop*. A free drop onto each corner of the package in succession, or in the case of a cylindrical package onto each quarter of each rim, from a height of 0.3 m (1 ft) onto a flat, essentially unyielding, horizontal surface. This test applies only to fiberboard, wood, or fissile material rectangular packages not exceeding 50 kg (110 lbs) and fiberboard, wood, or fissile material cylindrical packages not exceeding 100 kg (220 lbs).

(9) *Compression*. For packages weighing up to 5000 kg (11,000 lbs), the package must be subjected, for a period of 24 hours, to a compressive load applied uniformly to the top and bottom of the package in the position in which the package would normally be transported. The compressive load must be the greater of the following:

(i) The equivalent of 5 times the weight of the package; or

(ii) The equivalent of 13 kPa (2 lbf/in<sup>2</sup>) multiplied by the vertically projected area of the package.

(10) *Penetration*. Impact of the hemispherical end of a vertical steel cylinder of 3.2 cm (1.25 in) diameter and 6 kg (13 lbs) mass, dropped from a height of 1 m (40 in) onto the exposed surface of the package that is expected to be most vulnerable to puncture. The long axis of the cylinder must be perpendicular to the package surface.

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### §71.73 Hypothetical accident conditions.

(a) *Test procedures*. Evaluation for hypothetical accident conditions is to be based on sequential application of the tests specified in this section, in the order indicated, to determine their cumulative effect on a package or array of packages. An undamaged specimen may be used for the water immersion tests specified in paragraph (c)(6) of this section.

(b) *Test conditions*. With respect to the initial conditions for the tests, except for the water immersion tests, to demonstrate compliance with the requirements of this part during testing, the ambient air temperature before and after the tests must remain constant at that value between  $-29^{\circ}\text{C}$  ( $-20^{\circ}\text{F}$ ) and  $+38^{\circ}\text{C}$  ( $+100^{\circ}\text{F}$ ) which is most unfavorable for the feature under consideration. The initial internal pressure within the containment system must be the maximum normal operating pressure, unless a lower internal pressure, consistent with the ambient temperature assumed to precede and follow the tests, is more unfavorable.

(c) *Tests*. Tests for hypothetical accident conditions must be conducted as follows:

(1) *Free drop*. A free drop of the specimen through a distance of 9 m (30 ft) onto a flat, essentially unyielding, horizontal surface, striking the surface in a position for which maximum damage is expected.

(2) *Crush*. Subjection of the specimen to a dynamic crush test by positioning the specimen on a flat, essentially unyielding horizontal surface so as to suffer maximum damage by the drop of a 500-kg (1100-lb) mass from 9 m (30 ft) onto the specimen. The mass must consist of a solid mild steel plate 1 m (40 in) by 1 m (40 in) and must fall in a horizontal attitude. The crush test is required only when the specimen has a mass not greater than 500 kg (1100 lb), an overall density not greater than 1000 kg/m<sup>3</sup> (62.4 lb/ft<sup>3</sup>) based on external dimension, and radioactive contents greater than 1000 A<sub>2</sub> not as special form radioactive material. For packages containing fissile material, the radioactive contents greater than 1000 A<sub>2</sub> criterion does not apply.