



DEPARTMENT OF TRANSPORTATION  
HAZARDOUS MATERIALS REGULATIONS BOARD  
WASHINGTON, D.C. 20590

29483

[49 CFR Parts 171, 173, 174, 175, 177,  
178]

[Docket No. HM-111; Notice No. 73-7]

TRANSPORTATION OF HAZARDOUS  
MATERIALS

Miscellaneous Proposals Relating to  
Radioactive Materials

On October 4, 1968, the Hazardous Materials Regulations Board (the Board) published extensive amendments to the Department's Hazardous Materials Regulations relating to radioactive materials (33 FR 14918). Those amendments were instrumental in bringing the transportation regulations of this country into substantial conformity with the international standards for the transportation of radioactive materials. The international standards were promulgated by the International Atomic Energy Agency (IAEA) and published in its "Regulations for the Safe Transportation of Radioactive Materials," 1967 edition.

With over three years of experience in the application of those amendments by shippers, carriers, and the Department, the Board now believes there is need for a number of changes, many of which would be minor or editorial in nature. Many of these proposed changes have been suggested by various persons or have been developed by the Board in response to formal and informal comments as received. Several of the proposed changes have also been recommended by the U.S. Atomic Energy Commission. A number of these proposed changes would incorporate into the regulations various provisions which are now authorized under general type special permits held by many shippers, including several new specification packagings, which have been in use under special permits for several years with satisfactory experience.

The Board also wishes to note that at a future date, it will consider other, more substantive changes. Although the regulations relating to radioactive materials as amended October 4, 1968, conformed substantially at that time to the IAEA standards, the IAEA has been developing comprehensive revisions to its standards. In 1970 and 1971, regulatory review panels of the IAEA met. The membership on these panels comprised all major IAEA member states and international bodies, including the United States. The revisions to IAEA Safety Series No. 6 resulting from those panels have recently been published. The Board emphasizes that the substance of the changes proposed in this notice are not based on the most recent changes to the IAEA standards. However, to maintain United States' standards in as close conformity to international standards as possible, the Board intends to propose future changes as necessary; these proposed changes will be the subject of separate rule making.

Several additions to § 171.7 relating to later incorporated by reference are proposed. These additions generally re-

late to certain sections of the new specification packagings proposed to be added in Part 178.

In § 173.23, the reference to radioactive materials packagings previously authorized by the Bureau of Explosives would be deleted since such packagings have not been authorized for shipment since February 28, 1969.

Two of the proposed changes herein (§§ 173.202 and 173.206) would permit the transportation of small quantities of certain metals or alloys (also classed as flammable solids) when such materials are a component part of fissile or large quantity radioactive materials. The current packaging requirements for radioactive materials are substantially superior to those presently required in the regulations for these metals or alloys and the former are the requirements that are proposed. Also, many years of successful experience with shipments authorized on a special permit basis have been acquired for the proposed packaging.

The revision of Note 1 in § 173.69(a) and the addition of a footnote in § 173.226 would clarify that Class A detonating fuzes with radioactive components, and thorium metal also are subject to the provisions for radioactive materials.

In § 173.389, two additional definitions are proposed, i.e., "full load" and "closed transport vehicle." Based on its experience, the Board believes that these definitions are needed to clarify the administrative requirements for control of certain types of radioactive materials shipments.

The proposal in § 173.391(c) would change the requirement from no "detectable" radioactive surface contamination on certain packages of exempt manufactured articles containing natural uranium or depleted uranium to no "significant" contamination as provided for in § 173.397. Another proposed change to § 173.391(c) would add natural thorium and its alloys to the classes of material which could qualify as a certain type of exempt manufactured radioactive material.

Several changes to the provisions of § 173.392 are proposed to clarify the requirements for advance special arrangements and written instructions between the shipper and carrier for the transportation of "full loads" of low specific activity radioactive materials.

In § 173.393, the section heading would be amended to include general shipment as well as general packaging requirements. Section 173.393(j)(3) would also be amended to clarify the method of measuring the radiation level at six feet from a vehicle containing a "full load" of radioactive materials; § 173.393(L) would be amended for clarification and to make reference to the general requirements for packages destined for export; § 173.393(o) would be added to require that packages not be offered for transport until the temperature of the packaging system has reached equilibrium; § 173.393(k)

would be added to require that the inner containment vessel which comprises a separate unit of any portion of a packaging must be securely closed by a positive fastening device which is independent of any other part of the packaging. (This provision is intended to make it clear that a piece of masking tape is not sufficient to hold a lead plug in place.) Also in § 173.393(d), a significant change is proposed in conjunction with the authorized Type A packaging changes which are being proposed in §§ 173.394 and 173.395, i.e., the statement that the presently listed specification Type A packages " \* \* \* may be assumed to meet those standards, \* \* \*" would be deleted.

A further change is proposed to require that packages containing liquid radioactive materials meet the conditions of both § 173.393(g)(1) and (2). Such a change has been recommended by the National Transportation Safety Board in its "Special Study of the Transportation of Radioactive Materials by Air." It is felt that the double precaution provided by this approach will significantly improve the safety of such packages.

In §§ 173.394 and 173.395, the most significant proposed change relates to the change to the "performance criteria" concept for Type A packages. The present listing of the various authorized DOT specifications would be deleted. Instead, complete reliance would be placed (except for the DOT Spec. 55) on the use of the DOT-7A, Type A, general packaging specification. Also, one very significant requirement would be added, i.e., that each user of a Spec. 7A package would be required to document and maintain on file for one year after the latest shipment a written record of his determination of compliance with the DOT Spec. 7A performance requirement for the specific package design. The Board's experience indicates that the present method of listing DOT detailed design specifications is somewhat misleading when the general packaging requirements for radioactive materials are considered, i.e., liquid packaging requirements, shielding requirements, inner vessel closure, etc. The Board believes that the present method has resulted in a system which is misleading since it specifies only the "outer" packaging in most cases. It is possible that in some cases a shipper might mistakenly consider only the outer packaging requirements without properly taking into account the additional general requirements such as illustrated above. Concurrently with these changes, DOT Specification 55 is proposed to be deleted from Part 178. However, DOT Spec. 55 packaging would continue to be authorized for use in Part 173 but would be limited to packagings constructed prior to the effective date of the amendments in this docket. The Board intends to phase out this specification as a "limited Type B" packaging (up to 300 curies of special form material) at some later date.

Further additions to §§ 173.394 and 173.395 would prescribe the quantities of radioactive materials authorized in the new specification Type B DOT Spec. 20WC and 21WC packagings (DOT Special Permit Nos. 5684, 5800, 6008, and 5725) and would clarify that any approved Type B packaging may be used for a shipment of a Type A quantity of radioactive material.

Numerous changes also are proposed to the packaging provisions for fissile radioactive materials in § 173.396 and to the design requirements for the two specification packagings for fissile materials, i.e., the DOT Spec. 6L (§ 178.103) and Spec. 6M (§ 178.104). These proposed changes deal with modifications relating to the permitted radioactive material content, quantity, and physical details of construction of each packaging. Based on a recommendation received from the USAEC, DOT Spec. 2R (§ 178.34) is proposed to be extensively revised to provide more definitive requirements for flanged closures. These changes would also affect the design requirements for DOT Spec. 6L and Spec. 6M packagings, each of which utilizes a Spec. 2R inner containment vessel. Another change (§ 173.396 (f)) would provide for the shipment of Fissile Class II packages under Fissile Class III type controls, thus allowing commingling of Fissile Class II and III packages by a specific consignor. This provision is presently authorized under a special permit (SP 5908) issued to many shippers. Another provision, § 173.396(b) (7) would add a useful general package loading authorization for small amounts of fissile radioactive material as limited quantities of Uranium-235, in standard DOT specification steel drums (DOT SP 5021).

Also § 173.396(b) (6) and (c) (5) would prescribe the quantities of fissile uranium hexafluoride (UF<sub>6</sub>) that could be transported in the new DOT specification packagings 20PF and 21PF (new §§ 178.120 and 178.121). These are inner metal cylinders within certain types of phenolic-foam insulated steel protective overpacks (DOT SP 4909). Shipments of UF<sub>6</sub> have been performed routinely and successfully under this special permit for many years. In § 173.396(b) (8), the Board proposes to provide for the shipment of a limited quantity of uranium hexafluoride as a residual "heel" in a cylinder. These shipments, as Fissile Class I, would be permitted in a bare cylinder without overpack.

quantified

In § 173.397(a), changes are proposed to clarify the determination of the allowable amount of removable (non-fixed) radioactive surface contamination, in terms of quantified "significant removable contamination." The present provisions in § 173.397 are a modified version of the 1967 IAEA Standards in Marginal C-3.3 and Table IV, Annex I. The Hazardous Materials Regulations specify a method for determination of external removable surface contamination based on the activity on the "wipe" sample. That limit is set at 10 percent of the IAEA values on the surface itself.

Many questions have arisen with respect to the "averaging" of multiple wipe samples. The IAEA standards clearly allow for "averaging" of contamination over any area of 300 cm<sup>2</sup> of any part of the surface. The proposed revision of § 173.397(a) would provide that "averaging" is only allowable over any one 300

cm<sup>2</sup> area of any part of the surface and it is not allowed to average wipe samples from several 300 cm<sup>2</sup> areas. However, an exception is made for somewhat higher levels of contamination on packages consigned for "full load" shipments in § 173.397(b). In § 173.397(c), another change is proposed which would require each vehicle to be monitored after having been used for any "full load" shipment of radioactive material, and not only for a bulk shipment of low specific activity material, as is required by the present provisions of § 173.397(b).

Section 173.398(a) is proposed to be changed to require that each shipper of special form radioactive material document and maintain on file for one year after the latest shipment a certification and supporting safety analysis demonstrating the method of determination that the special form test requirements were met. Also, requirements are proposed which outline the information to be submitted to the Department in petitions for certifications of special form designs when foreign shipments of these materials are intended. These requirements are based on provisions of the IAEA regulations. In this regard it should be noted that in some countries, competent authority certification is required domestically for all special form materials.

In § 173.399, the reference to the labeling requirement for packages previously approved by the Bureau of Explosives would be deleted since it is no longer appropriate. In § 173.401, a requirement to mark the gross weight on packages exceeding 110 pounds would be imposed to achieve consistency with an equivalent international requirement. A further clarifying provision would also be added to require the external marking of any Type A or Type B package, as appropriate, including the letters "USA", if foreign shipments are involved. Section 173.404(a) would be amended to make it clear that the blank spaces on the package labels must be filled in as appropriate. Further, a new § 173.416(d) would be added to provide more precise guidance in completing the label entries; there has been some degree of confusion on this matter during the past few years.

Two significant changes are being proposed to the rail and motor vehicle carrier requirements in Parts 174, 175, and 177. One change would provide for the controlled spacing of groups of packages at 20-foot distances, when more than one group containing 50 transport indices or less is present in any single storage area. This provision is presently contained in the IAEA regulations as well as in the U.S. Coast Guard regulations in 46 CFR Parts 146-149. The other change which would apply to carriers would clearly specify that in preparing their manifests, waybills, etc., for radioactive materials shipments, the carrier must transpose all of the applicable shipping paper information as it has been supplied by the shipper pursuant to § 173.427(a) (5). Under the present carrier regulations in Parts 174, 175, and 177, the carrier is only required to include on his shipping papers the proper shipping name and the classification of the material, with the result that the information being supplied by the shipper in many cases does not accompany the shipment during transportation.

In Part 178, major revisions to ex requirements for DOT Specification 6L, and 6M are proposed. New specifications DOT 20PF, 21PF, 20WC, and are also proposed.

In consideration of the foregoing proposed to amend 49 CFR Part 173, 174, 175, 177, and 178 as follows:  
**PART 171—GENERAL INFORMATION REGULATIONS**

In § 171.7, paragraphs (c) (18) through (20), (d) (4) (I), (d) (4) (II), (III), (d) (13), (d) (14), and (c) would be added to read as follows:

§ 171.7 Matter incorporated by  
ence.

(c) \* \* \*  
(18) AWWA: American Water Association, 2 Park Avenue, New York 10016.

(19) AWS: American Welding Society, 345 East 47th Street, New York 10016.

(20) USDC: U.S. Department of Commerce, National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia 22151.

(d) \* \* \*  
(4) \* \* \*  
(i) American National Standard 16.5 is titled, "Steel Pipe Flange Fittings," 1968 edition.

(ii) American National Standard 14.1-1971 is titled, "Packaging of Radium Hexafluoride for Transport."

(5) \* \* \*  
(iii) ASTM D1056 is titled, "Standard Specification for Expanded Cellular Rubber Product and Tests for," 1968 edition.

(13) American Water Works Association (AWWA) Standard C207-55 is "AWWA Standard for Steel Flanges," 1955 edition.

(14) American Welding Society (AWS) AWS Code B-3.0 is "Standard Qualification Procedure

(i) AWS Code D-1.0 is titled, for Welding in Building Construction

(15) USDC, CAPE-1662, one of a series of "Civilian Applications for Engineering Drawings" which is a page of information including drawings and bills of material, describing phenolic foam insulated, protective overpack

(i) USDC, USAEC Material Equipment Specification No. SP titled, "Fire Resistant Phenolic Foam

(ii) USDC, ORO-651 is titled, "Radium Hexafluoride Handling Procedure and Container Criteria," Revision 3

**PART 173—SHIPPERS**

In Part 173 Table of Contents, § 173.398 would be amended to read as follows:

Sec. 173.398 General packaging and shipping requirements.

In § 173.23, paragraph (c) would be deleted as follows:

§ 173.23 Previously authorized packaging.

(c) [Deleted]

In § 173.69, paragraph (a) would be amended to read as follows:

**173.69 Detonating fuzes, Class A, with or without radioactive components, detonating fuze parts containing an explosive, boosters, bursters, or supplementary charges.**

(a) \* \* \*

NOTE.—A fuze with any radioactive component is also subject to the applicable provisions of §§ 173.389 through 173.399 for the radioactive material.

In § 173.202, paragraph (b) would be added to read as follows:

**§ 173.202 Sodium and potassium, metallic liquid alloy.**

(b) Packaging of metallic liquid alloys of sodium or potassium in combination with fissile or large quantities of radioactive material, is authorized as provided in § 173.206 (a) (10) and (11).

In § 173.206, paragraph (a) (10) would be amended; paragraph (a) (11) would be added to read as follows:

**§ 173.206 Sodium or potassium, metallic, sodium amide, sodium potassium alloys, sodium aluminum hydride, lithium metal, lithium silicon, lithium ferro silicon, lithium hydride, and lithium aluminum hydride.**

(a) \* \* \*

(10) Tubes of stainless steel, or other metals of equivalent strength and non-reactivity, having sealed, welded ends, and containing not more than 50 grams of metal. Authorized only for metallic sodium, metallic lithium, metallic potassium, and sodium potassium alloy which may be in combination with fissile or a large quantity of radioactive material. Each tube must be enclosed within a secondary, sealed metallic tube and further enclosed within strong tight outer packaging.

(11) Any packaging as prescribed in §§ 173.394(c), 173.395(c), or 173.396(c). Authorized for not more than 25 pounds of any material listed in paragraph (a) of this section including mixtures thereof, and which may be in combination with fissile or a large quantity of radioactive material.

In § 173.226, a note would be added following the heading to read as follows:

**§ 173.226 Thorium metal, powdered.**

NOTE.—Thorium metal, a low specific activity radioactive material, is also subject to the applicable provisions of §§ 173.389 through 173.399.

In § 173.389, paragraphs (o) and (p) would be added to read as follows:

**§ 173.389 Radioactive materials; definitions.**

(o) "Full load" (also referred to as "sole use" or "exclusive use") means any shipment:

- (1) From a single consignor having exclusive use of a transport vehicle of an aircraft, or of a hold or compartment of an inland watercraft, or of a

hold, compartment, or defined deck area of a seagoing vessel; and

(2) For which all initial, intermediate, and final loading and unloading is carried out by or under the direction of the consignor, consignee, or his designated agent.

(p) "Closed transport vehicle" means a vehicle equipped with a securely attached exterior enclosure, which during normal transport, restricts the access of unauthorized persons to the cargo space containing the radioactive materials. The enclosure may be either temporary or permanent, may be of the "see-through" type, and must limit access from top, sides, and ends.

In § 173.391, the introductory text of paragraph (c), paragraphs (b) (3), (c) (2), and (c) (4) would be amended to read as follows:

**§ 173.391. Small quantities of radioactive materials and radioactive devices.**

(b) \* \* \*

(3) The radiation dose rate at any point on the external surface of the outside of the package may not exceed 0.5 millirem per hour. However, for full-load shipments only, the radiation at the external surface of the package or the item may exceed 0.5 millirem per hour, but must not exceed 2 millirem per hour.

(c) A manufactured article, other than reactor fuel elements, in which the only radioactive material is metallic natural or depleted uranium or natural thorium or alloys thereof, is exempt from specification packaging, marking, and labeling, and is exempt from the provisions of § 173.393, if the following conditions are met:

(2) There must be no significant radioactive surface contamination on the exterior of the package. To determine whether "significant," the standard in § 173.397 must be used.

(4) The outer surface of the uranium or thorium is enclosed in a non-radioactive, sealed, metallic sheath.

(Note remains the same.)

In § 173.392, paragraphs (a) and (b) would be amended; paragraphs (c) (9) and (d) (7) would be added to read as follows:

**§ 173.392 Low specific activity radioactive material.**

(a) Low specific activity (LSA) radioactive materials, when transported on a transport vehicle, other than materials consigned as a full-load, are exempt from the provisions of § 173.393 (a) through (e) and (g). However, they must be packaged in strong tight packages in accordance with § 173.24 and must be marked and labeled as required in §§ 173.401 and 173.402.

(b) LSA radioactive materials which are transported in a transport vehicle

(except aircraft) and consigned as a full-load are exempt from specification packaging, marking (§ 173.401), and labeling (§§ 173.402 to 173.404), provided the shipment meets the requirements of paragraph (c) or (d) of this section.

(c) \* \* \*

(9) Specific instructions for maintenance of full-load (sole use) shipment controls must be provided by the shipper to the carrier. Such instructions must be included with the shipping paper information.

(d) \* \* \*

(7) Specific instructions for maintenance of full-load (sole use) shipment controls must be provided by the shipper to carrier. Such instructions must be included with the shipping paper information.

In § 173.393, the heading and the introductory texts of paragraphs (d), (e), (g), and (j) would be amended; paragraphs (g) (1), (j) (3), and (l) would be amended; paragraphs (k) and (o) would be added to read as follows:

**§ 173.393 General packaging and shipment requirements.**

(d) Each radioactive material must be packaged in a packaging which has been designed to maintain shielding efficiency and leak tightness, so that, under conditions normally incident to transportation, there will be no release of radioactive material. If necessary, additional suitable inside packaging must be used. Each package must be capable of meeting the standards in §§ 173.398(b) and 173.24.

(e) The packaging must be designed, constructed, and loaded so that during transport:

(g) Liquid radioactive material must be packaged in or within a leak-resistant and corrosion-resistant inner container. Except as provided in § 173.396(b) (7):

- (1) The packaging must be adequate to prevent loss or dispersal of the radioactive contents from the inner container if the package were subjected to the 30-foot drop test prescribed in § 173.398(c) (2) (i); and

(j) Packages for which the radiation dose rate exceeds the limits specified in paragraph (i) of this section, but does not exceed at any time during transportation any of the limits specified in subparagraphs (1) through (4) of this paragraph may be transported in a transport vehicle which has been consigned as a full-load (except aircraft). Specific instructions for maintenance of the full-load (sole use) shipment controls must be provided by the shipper to the carrier. Such instructions must be included with the shipping paper information:

- (3) Ten millirem per hour at any point six feet from the vertical planes projected by the outer lateral surface

of the car or vehicle; or if the load is transported in an open transport vehicle, at any point six feet from the vertical planes projected from the outer edges of the vehicle.

(k) An inner containment system which is a separate unit of any packaging must be securely closed by a positive fastening device which is independent of any part of the other packaging.

(l) Packages consigned for export are also subject to the regulations of the foreign governments involved in the shipment. See §§ 173.8, 173.9, and 173.393b. (The regulations of the International Atomic Energy Agency (IAEA) are used by most foreign governments.)

(o) No person may offer for transportation a package of radioactive materials until the temperature of the packaging system has reached equilibrium (see also paragraph (e) of this section) unless, for the specific contents, it has been ascertained that the maximum applicable surface temperature limits cannot be exceeded.

In § 173.394, paragraphs (a), (b)(1), and (b)(2) would be amended; paragraphs (b)(5), (b)(6), and (c)(4) would be added to read as follows:

**§ 173.394 Radioactive material in special form.**

(a) A Type A quantity of special form radioactive material must be packaged as follows:

(1) Specification 7A (§ 173.350 of this subchapter) Type A general packaging. Each shipper of a Spec. 7A packaging must maintain on file for at least one year after the latest shipment, and be prepared to provide the Department, a complete certification and supporting safety analysis demonstrating that the construction methods, packaging design, and materials of construction are in compliance with the specification.

(2) Specification 55 metal encased shielded container. Use of existing container authorized; construction not authorized after (effective date of these amendments).

(3) Any Type B packaging pursuant to paragraph (b) of this section.

(4) Foreign-made packagings which bear the marking "TYPE A."

(b) . . . .

(1) Specification 55 metal encased shielded container. Authorized only for domestic shipments of not more than 300 curies per package. Use of existing container authorized; construction not authorized after (effective date of these amendments).

(2) Specification 6M (§ 178.104 of this subchapter) metal packaging.

(5) Specification 20WC (§ 178.194 of this subchapter) wooden-steel protective jacket, with a single snug-fitting inner Type A packaging which has a metal outer wall and conforms to § 173.350 of this subchapter or Specification 55. Only use of existing Spec. 55 container authorized; construction not authorized after (effective date of these amendments).

(6) Specification 21WC (§ 178.195 of this subchapter) wooden-steel protective overpack, with a single inner Spec. 2R (§ 178.34 of this subchapter) or Spec. 55, inner packaging. Only use of existing Spec. 55 container authorized; construction not authorized after (effective date of these amendments). Contents must be loaded within the inner packaging to preclude loose movement during transportation. The inner packaging must be securely positioned and centered within the overpack by solid cushioning materials so that there would be no significant displacement of the inner packaging if the packaging were subjected to the 30-foot drop test described in § 173.398 (c)(1).

(c) . . . .  
(4) Specification 20WC (§ 178.194 of this subchapter) wooden outer protective jacket, with a single snug-fitting Spec. 55 inner packaging. Only use of existing Spec. 55 container authorized; construction not authorized after (effective date of these amendments). Radioactive thermal decay energy must not exceed 100 watts.

In § 173.395, paragraph (a) would be amended; paragraph (b)(4) would be added to read as follows:

**§ 173.395 Radioactive material in normal form.**

(a) A Type A quantity of normal form radioactive material must be packaged as follows:

(1) Specification 7A (§ 173.350 of this subchapter) Type A general packaging. Each shipper of a Spec. 7A packaging must maintain on file for at least one year after the latest shipment, and be prepared to provide the Department, a complete certification and supporting safety analysis demonstrating that the construction methods, packaging design, and materials of construction are in compliance with the specification.

(2) Specification, 55 metal encased shielded container. Use of existing container authorized; construction not authorized after (effective date of these amendments). For liquid contents the provisions of § 173.393 (g)(1) and (g)(2) must also be met.

(3) Any Type B packaging pursuant to paragraph (b) of this section.

(4) Foreign-made packagings which bear the marking "TYPE A."

(b) . . . .

(4) Specification 20WC (§ 178.194 of this subchapter) wooden outer protective jacket, when used with a single, snug-fitting inner Spec. 2R (§ 178.34 of this subchapter) or Spec. 55 inner packaging. Only use of existing Spec. 55 container authorized; construction not authorized after (effective date of these amendments). For liquid contents the provisions of § 173.393 (g)(1) and (g)(2) must also be met, with respect to the inner packaging.

In § 173.396, paragraphs (b)(1), (c)(1), and (c)(2)(ii) would be amended; paragraphs (b)(6), (b)(7), (b)(8), (c)(5), (f)(1), (f)(2), and (f)(3) would be added to read as follows:

**§ 173.396 Fissile radioactive material.**

. . . .

(b) . . . .

(1) Specification 6L (§ 178.103 of this subchapter) metal packaging. See paragraph (c)(1) of this section for authorized contents.

. . . .

(6) Specifications 20PF-1, 20PF-2, 20PF-3 (§ 178.120 of this subchapter) or Spec. 21PF-1 or 2 (§ 178.121 of this subchapter) phenolic-foam insulated protective overpacks, with snug-fitting inner metal cylinders meeting all of the applicable requirements of §§ 173.2173.393, and 173.398(b). Handling procedures and packaging criteria must be accordance with USAEC Report N ORO-651 or ANSI Standard N-14.1-197. Quantities of uranium hexafluoride with an atomic ratio of hydrogen to uranium not to exceed 0.088 are authorized as follows, with each package to be shipped: Fissile Class II, and assigned a minimum transport index as indicated:

Protective overpack specification No.	Maximum inner cylinder diameter (inches)	Maximum weight of UF <sub>6</sub> contents (lbs.)	Maximum U <sup>235</sup> enrichment (w/o)	Fissile class transp index
20PF-1-----	1-5	55	100	.
20PF-2-----	8	255	12.5	.
20PF-3-----	12	460	5.0	.
21PF-1-----	30	4960	5.0	.
21PF-2-----	30	5020	6.0	.

(7) A DOT Specification 6J (§ 178.116 of this subchapter) or 17H (§ 178.118 of this subchapter) 55-gallon steel drum for transport of not more than 350 gram of uranium-235 in any non-pyrophoric form, enriched to any degree in the 1235 isotope. Each drum must have minimum 18-gage body and bottom head; and 16-gage removable top head, with one or more corrugations in the cover near the periphery. Closure must conform to § 178.103-5(a) of this subchapter. At least four 0.5 inch diameter vent holes must be provided, equally spaced on the sides of the drum near the top each covered with weatherproof tape or equivalent device. Appropriate primary inner containment of the content must be provided, such as plastic metal jars or cans, plastic wrapper. Each inner container must be capable venting in the event the package was exposed to a severe fire (§ 173.398(c)(iii)). Additionally, liquid contents must be packaged in accordance with § 173.393 (g)(2). The maximum weight of contents, including internal packing must not exceed 200 pounds, with fissile material content limited as follows:

Maximum U <sup>235</sup> per package (grams)	Minimum transport index per package as fissile class I <sup>a</sup>	Maximum packages per transport vehicle as fissile class
350	1.8	
300	1.0	
250	0.6	
200	0.3	
150	0.1	
100	0.1	(1)
50	(1)	(1)

<sup>a</sup> Fissile class I.

(8) Any metal cylinder which meets the performance requirements for a Spec. 7A Type A packaging (see §§ 173.395(a)(1) and 178.350) for the transport of residual "heels" of enriched solid uranium hexafluoride without a protective overpack, are authorized as Fissile Class I packages, in accordance with the following:

Maximum cylinder diameter (inches)	Cylinder volume (cubic feet)	Maximum U <sup>235</sup> enrichment (weight percent)	Maximum "heel" weight per cylinder	
			(lbs. UF <sup>6</sup> )	Kgs. U <sup>235</sup>
5	0.311	100.0	0.1	0.031
8	1.359	12.5	0.5	0.019
12	2.410	5.0	1.0	0.015
30	25.64	5.0	25.0	0.383

(c) \* \* \*

(1) Specification 6L (§ 178.103 of this

TABLE OF AUTHORIZED CONTENTS<sup>1</sup>

H/X ≤ 3	Uranium-235 <sup>2</sup>		Plutonium <sup>3</sup>		Fissile class II transport index	Fissile class III maximum number of packages per transport vehicle
	3 < H/X ≤ 20	H/X ≤ 10	10 ≤ H/X ≤ 20			
14	3.6	2.5	2.4	1.3	80	
				1.8	55	

<sup>1</sup> Quantity in kilograms.

<sup>2</sup> All sources of hydrogen within the inner containment vessel must be considered in determining the H/X ratio of inner containment vessel.

<sup>3</sup> Volume not to exceed 3.6 liters.

(2) \* \* \*

(ii) Fissile Class II and III packages. Quantities of fissile radioactive material shown in the following table are authorized for a Fissile Class II and Fissile Class III package. Where a maximum ratio of hydrogen to fissile material is specified in the table, only the hydrogen interspersed with the fissile material need be considered. For a Fissile Class II package, the minimum transport index to be assigned is shown in the following table. For a Fissile Class III package,

subchapter) metal packaging. Authorized only for uranium-233, uranium-235, plutonium-239 or 241, as metal, oxide, or compounds which will not decompose at temperatures up to 300° F. (149° C.) in accordance with the following:

(i) Fissile Class I packages. The following quantity of fissile radioactive material is authorized for Fissile Class I packages; 2.5 kilograms U-235; 1.5 kilograms of plutonium (except plutonium-238, which is not authorized); or 1.0 kilograms of uranium-233. The maximum ratio of hydrogen to fissile material must not exceed three, all sources of hydrogen within the Spec. 2R inner containment vessel being considered.

(ii) Fissile Class II and III packages. The following quantities of fissile radioactive materials are authorized under the Fissile Class II and III conditions listed:

the maximum number of similar packages per transport vehicle is shown. Each Fissile Class II shipment is also subject to paragraph (g) of this section. For a uranium-233 shipment, the maximum inside diameter of the inner containment vessel must not exceed 4.75 inches. Where necessary, a tight fitting steel insert must be used to reduce a larger diameter inner containment vessel specified in § 178.104-3(b) of this subchapter to the 4.75 inches limit.

TABLE OF AUTHORIZED CONTENTS<sup>1</sup>

Uranium-233 <sup>2</sup>			Uranium-235 <sup>4</sup>			Plutonium <sup>1, 3, 4</sup>			Fissile Class II transport index	Fissile Class III, maximum number of packages per transport vehicle
Metal or alloy	Compounds		Metal or alloy	Compounds		Metal or alloy	Compounds			
H/X=0	H/X=0	H/X=3	H/X=0	H/X=0	H/X=3	H/X=0	H/X=0	H/X=3		
3.8	4.4	2.9	7.2	7.6	5.3	3.1	4.1	3.4	0.1	1,250
4.2	5.2	3.5	8.7	9.6	6.4	3.4	4.5	4.1	0.2	625
4.5	6.8	4.5	11.2	13.9	8.3	4.2		4.5	0.5	280
			13.5	16.0	10.1	4.5			1.0	125
				26.0	16.1				5.0	25
				32.0	19.6				10.0	12

<sup>1</sup> Quantity in kilograms.

<sup>2</sup> Minimum percentage of plutonium-240 is 5 weight percent.

<sup>3</sup> 4.5 kilogram limitation of plutonium due to 10 watt decay heat limitation.

<sup>4</sup> For a mixture of uranium-235 and plutonium an equal amount of uranium-235 may be substituted for any portion of plutonium authorized.

<sup>5</sup> Maximum inside diameter not to exceed 4.75 inches (see paragraph (c)(2)(ii) of this section).

<sup>6</sup> Granulated or powdered metal with any particle less than 0.25 inch in the smallest dimension is not authorized.

(5) Specification 20PF-1 through 3 (§ 178.120 of this subchapter) or Specification 21PF-1 or 2 (§ 178.121 of this subchapter) phenolic-foam insulated protective overpacks. (See paragraph (b) 5) of this section for authorized use.)

(f) \* \* \*

(1) Transportation of packages authorized as Fissile Class II is also authorized as Fissile Class III under the conditions prescribed in paragraph (g) of this section. The total of the transport indexes for all packages in the vehicle must not exceed 100.

(2) Shipments of combinations of Fissile Class II and Fissile Class III packages are also authorized provided that:

(i) Each Fissile Class III package has a transport index value assigned to it;

(ii) No single Fissile Class III package has a transport index value exceeding 50;

(iii) The total of the transport indexes of all packages in the shipment does not exceed 100; and

(iv) The shipment is transported as a Fissile Class III shipment pursuant to paragraph (g) of this section.

(3) The provisions of paragraphs (f) (1) and (2) of this section do not apply to shipments transported by water.

§ 173.397 would be amended to read as follows:

§ 173.397 Contamination control.

(a) Removable (non-fixed) radioactive contamination is considered significant if the level of contamination, when averaged over any area of 300 square centimeters of any part of the package surface, exceeds either of the following:

Contaminant	Maximum permissible level	
	µCi/Cm <sup>2</sup>	dis/min/Cm <sup>2</sup>
Natural or depleted uranium and natural thorium		
Alpha	10 <sup>-3</sup>	2200
Beta-gamma	10 <sup>-4</sup>	220
All other beta-gamma emitting radionuclides	10 <sup>-4</sup>	220
All other alpha emitting radionuclides	10 <sup>-5</sup>	22

(1) In assessing the surface contamination of a package, a sufficient number of wipe samples must be taken in the most appropriate locations so as to yield a representative assessment of the contamination situation. The average amount of removable (non-fixed) radioactive contamination may be determined by wiping the external surface of the package with an absorbent material, using moderate pressure, and then measuring the activity on the wiping material. If the measured activity per square centimeter does not exceed 10 percent of the levels prescribed above, it may be assumed that those levels have not been exceeded.

(b) When radioactive materials packages are consigned as a full load, as defined in § 173.389(o), removable (non-fixed) radioactive contamination is considered to be significant if the level of contamination exceeds 10 times that as specified in paragraph (a) of this section.

(c) Each transport vehicle used for transporting radioactive materials as a full load, as defined in § 173.389(o), must be surveyed with appropriate radiation detection instruments after each use. A vehicle may not be returned to service until the radiation dose rate at any accessible surface is 0.5 millirem per hour or less, and there is no significant removable radioactive surface contamination, as defined in paragraph (a) of this section.

In § 173.398, Notes 1 and 2 would be added following paragraph (a) (4) to read as follows:

§ 173.398 Special tests.

- (a) \* \* \*
- (4) \* \* \*

NOTE 1.—Each shipper of special form radioactive material shall maintain on file for at least one year after the latest shipment, and be prepared to provide the Department, a complete certification and supporting safety analysis (see Note 2) demonstrating that the special form material meets the requirements of paragraph (a) of this section.

NOTE 2.—Prior to the first shipment of a special form radioactive material outside of the USA, each shipper shall obtain a Certificate of Competent Authority for the specific material. Each petition must be submitted in accordance with § 173.393b (b) and (c); and must additionally include the following information:

- (i) A detailed description of the material, or if a capsule, the contents. Particular reference must be made to both physical and chemical states;
- (ii) A detailed statement of the design of any capsule to be used, including complete engineering drawings and schedules of material, and methods of construction;
- (iii) A statement of the tests which have been done and their results, or evidence based on calculative methods to show that the material is capable of meeting the tests, or other evidence that the special form radioactive material meets the requirements of paragraph (a) (1) thru (4) of this section.

In § 173.399, paragraph (a) (3) (ii) would be amended; paragraph (a) (3) (iii) would be deleted as follows:

§ 173.399 Labeling of packages of radioactive materials.

- (a) \* \* \*
- (3) \* \* \*
- (ii) Each package containing a large quantity of radioactive material as defined in § 173.389(b).
- (iii) Deleted.

In § 173.401, paragraph (f) would be added to read as follows:

§ 173.401 Hazardous materials.

(f) Additional markings on packages containing radioactive materials are required as follows:

- (1) Each package of radioactive materials in excess of 110 pounds must have its gross weight plainly and durably marked on the outside of the package.
- (2) Each package of radioactive materials which conforms to the requirements for Type A or Type B packaging (§§ 173.389 (j) and (k) and 173.398 (b) and (c)) must be plainly and durably marked on the outside of the package in letters at least 1/2 inch high, with the words "TYPE A" or "TYPE B" as appropriate. A packaging which is not in compliance with these requirements must not be so marked. Each package of hazardous materials destined for export

shipment must also be marked "USA" in conjunction with the specification marking, special permit, or other package certificate identification. (See §§ 173.393a and 173.393b.)

In § 173.404, paragraph (a) would be amended to read as follows:

§ 173.404 Labels.

(a) A person who offers for transportation a package containing hazardous material shall conspicuously label it in compliance with the requirements of this Part. The applicable information as required in any blank spaces on the label must be inserted by legible printing, using a durable, waterproof means of marking. Labels should be applied to that part of the package bearing the consignee's name and address.

In § 173.416, paragraph (d) would be added to read as follows:

§ 173.416 Radioactive materials labels.

(d) The following requirements apply to completion of the items of information in the blank spaces of the labels specified in this section:

(1) "Contents"—The name of the radionuclide, as taken from the listing of radionuclides in § 173.390 (symbols are authorized, i.e., Mo-99, Co-60, etc.). For mixtures of radionuclides, the most restrictive radionuclides must be listed as space on the label allows.

(2) "Number of curies"—Units may also be expressed in appropriate curie units, i.e., curies (Ci), millicuries (mCi) or microcuries (uCi) (abbreviations are authorized). For a fissile material, the weight in grams or kilograms of the fissile radioisotope may be inserted.

(3) "Transport index"—(See § 173.389(i).)

PART 174—CARRIERS BY RAIL FREIGHT

In § 174.584, paragraph (i) would be added to read as follows:

§ 174.584 Waybills, switching orders, or other billing.

(i) For shipments of radioactive materials, the waybill, manifest, or other billing as prepared from the shipper's papers, must additionally contain all the information provided pursuant to § 173.427(a) (5) of this subchapter.

In § 174.586, paragraph (h) (1) would be amended; Note 2 would be added following paragraph (h) (2) Note 1 to read as follows:

§ 174.586 Handling hazardous materials.

(h) \* \* \*

(1) The number of packages of radioactive materials, as provided in §§ 173.393 through 173.396 of this subchapter, in any rail car or storage location, must be limited so that the total transport index number, as defined in § 173.389(i) of this subchapter and determined by adding together the transport index numbers on the labels of the

individual packages does not exceed 1. This provision does not apply to sole use shipments described in § 173.393 (f), 173.396 (f), or 173.392 of this subchapter.

NOTE 2.—Where more than one group of packages is present in any storage location a single group may not have a total transport index greater than 50. Each group of packages must be handled and stowed not closer than 30 feet to any other group.

PART 175—CARRIERS BY RAIL EXPRESS

In § 175.652a, paragraph (c) would be amended to read as follows:

§ 175.652a Shipping papers.

(c) Waybills or delivery sheets used, waybills, or other billing issued in place thereof, prepared from the shipping papers, and the transfer sheet or interchange record used for transferring such shipments to a connecting carrier, must contain the information required by paragraphs (a) and (b) of this section. Additionally, in the case of radioactive materials, each such waybill, delivery sheet, or other billing and such transfer sheet or interchange record must also contain all the information provided pursuant to § 173.427(a) (5) of this subchapter.

In § 175.655 paragraph (j) (1) would be amended; Note 2 would be added following paragraph (j) (2) Note 1 to read as follows:

§ 175.655 Protection of packages.

(j) \* \* \*

(1) The number of packages of radioactive materials, as provided in §§ 173.393 through 173.396 of this subchapter in any rail car or storage location, must be limited so that the total transport index number, as defined in § 173.389(i) of this subchapter and determined by adding together the transport index numbers on the labels of the individual packages, does not exceed 50. This provision does not apply to sole-use shipments described in § 173.393 (j), 173.396 (f), or 173.392 of this subchapter.

(2) \* \* \*

NOTE 2.—Where more than one group of packages is present in any storage location a single group may not have a total transport index greater than 50. Each group of packages must be handled and stowed not closer than 30 feet to any other group.

PART 177—SHIPMENTS MADE BY WAY OF COMMON, CONTRACT, OR PRIVATE CARRIERS BY PUBLIC HIGHWAY

In § 177.817, the introductory text of paragraph (a) would be amended to read as follows:

§ 177.817 Shipping papers.

(a) A carrier may not accept for transportation nor transport any hazardous material subject to the regulations in this subchapter unless that material is described on the shipping paper by the shipping name prescribed in

172.5 of this subchapter and by the classification prescribed in § 172.4 of this subchapter. A further description consistent therewith may be included. Abbreviations may not be used. The total quantity by weight, volume, or as otherwise appropriate, must be shown. Additionally, in the case of a radioactive material shipment, each shipping paper must include all the information provided pursuant to § 173.427(a) (5) of this subchapter.

In § 177.834, paragraph (a) would be amended to read as follows:

**§ 177.834 General requirements.**

(a) *Packages secured in a vehicle.*— Any tank, barrel, drum, cylinder, or other packaging, not permanently attached to a motor vehicle, which contains any flammable liquid, compressed gas, corrosive material, poisonous material, or radioactive material must be secured against movement within the vehicle on which it is being transported, under conditions normally incident to transportation.

In § 177.842, paragraphs (a) and (b) would be amended to read as follows:

**§ 177.842 Radioactive material.**

(a) The number of packages of radioactive materials, as provided in §§ 173.393 through 173.396 of this subchapter, in any rail car or storage location, must be limited so that the total transport index number, as defined in § 173.389(i) of this subchapter and determined by adding together the transport index numbers on the labels of the individual packages does not exceed 50. This provision does not apply to sole-use shipments described in § 173.393(j), 173.396(f), or 173.392 of this subchapter.

(b) Packages of radioactive material bearing "radioactive yellow-II" or "radioactive yellow-III" labels must not be placed in a motor vehicle or in any other place closer than the distances shown in the following table to any area which may be continuously occupied by passengers, employees, or shipments of animals, nor closer than the distances shown in the table below to any package containing undeveloped film (if so marked). If more than one of these packages is present, the distance shall be computed from the following table on the basis of the total transport index number (determined by adding together the transport index numbers on the labels of the individual packages) or packages in the vehicle or storeroom. Where more than one group of packages is present in any single storage location, a single group may not have a total transport index greater than 50. Each group of packages must be handled and stowed not closer than 20 feet to any other group.

**PART 178—SHIPPING CONTAINER SPECIFICATIONS**

In Part 178 Table of Contents, § 178.250 would be deleted; § 178.34 would be amended; §§ 178.120, 178.121, 178.194,

and 178.195 would be added to read as follows:

Sec.	
178.34	Specification 2R; inside containment vessel.
178.120	Specification 20PF phenolic-foam insulated, metal overpack.
178.121	Specification 21PF fire and shock resistant, phenolic-foam insulated, metal overpack.
178.194	Specification 20WC wooden protective jacket.
178.195	Specification 21WC wooden-steel protective overpack.

§ 178.34 would be amended to read as follows:

**§ 178.34 Specification 2R; inside containment vessel.**

**§ 178.34-1 General requirements.**

(a) Each vessel must be made of stainless steel, malleable iron, or brass, or other material having equivalent physical strength and fire resistance.

(b) Each vessel must meet all of the applicable requirements of §§ 173.24(c) and (d) of this subchapter. Letters and numerals at least 1/4-inch in height are authorized for the marking of a vessel not exceeding 2 inches inside diameter.

**§ 178.34-2 Manufacture.**

The ends of the vessel must be fitted with screw-type closures or flanges (see § 178.34-4), except that one or both ends of the vessel may be permanently closed by a welded or brazed plate. Welded or brazed side seams are authorized.

**§ 178.34-3 Dimensions.**

(a) The inside diameter of the vessel may not exceed 12 inches, exclusive of flanges for handling or fastening devices and must have wall thickness and length in accordance with the following:

Inside diameter maximum (inches)	Wall thickness minimum (inches)		Length maximum (inches)
	Threaded closure	Flanged closure	
2	3/32	Not less than that prescribed for schedule 40 pipe.	16
6	3/16		72
12	3/8		72

Nominal pipe size (inches)	Flange O.D. (inches)	Number of bolts	Bolt circle diameter (inches)	Diameter of bolts (inches)	Flange thickness (inches)
2	6	4	4 1/2	3/8	3/8
2 1/2	7	4	5 1/2	3/8	3/8
3	7 1/2	4	6	3/8	3/8
3 1/2	8 1/2	8	7	3/8	3/8
4	9	8	7 1/2	3/8	3/8
5	10	8	8 1/2	3/8	3/8

(iv) Cast iron flanges prohibited.

In § 178.103, §§ 178.103-1, and 178.103-3 would be amended; paragraph (a) in §§ 178.103-4, and 178.103-5 would be amended; in § 178.103-2 paragraph (b) would be added to read as follows:

**§ 178.103 Specification 6L; metal packaging.**

**§ 178.103-1 General requirements.**

Each packaging must meet the applicable requirements of § 173.24 of this subchapter.

**§ 178.34-4 Closure devices.**

(a) Each closure device must be as follows:

(1) Screw-type cap or plug; number of threads per inch must not be less than United States standard pipe threads and must have sufficient length of thread to engage at least 5 threads when securely tightened. Pipe threads must be luted with an appropriate non-hardening compound which must be capable of withstanding up to 250° F. (121° C.) without loss of efficiency. Tightening torque must be adequate to maintain leak tightness with the specific luting compound.

(2) An opening may be closed by a securely bolted flange and leak-tight gasket. Each flange must be welded or brazed to the body of the 2R vessel per American National Standards Institute (ANSI) Standard B16.5 or American Water Works Association (AWWA) Standard C207-55, section 10. A torque wrench must be used in securing the flange with a corresponding torque of no more than twice the force necessary to seal the selected gasket. Gasket material must be capable of withstanding up to 250° F. (121° C.) without loss of efficiency. The flange, whether of ferrous or nonferrous metal, must be constructed from the same metal as the vessel and must meet the dimensional and fabrication specifications for welded construction as follows:

(i) Pipe flanges described in Tables 13, 14, 16, 17, 19, 20, 22, 23, 25, and 26 of ANSI B16.5.

(ii) For nominal pipe sizes 6, 8, 10, and 12 inches, AWWA Standard C207-55, Table 1, class B, may be used in place of the tables prescribed by paragraph (a) (2) (i) of this section.

(iii) Sizes under 6 inches, nominal pipe size, the following table with the same configuration as illustrated in AWWA C207-55, Table 1, class B, may be used in place of paragraph (a) (2) (i) of this section.

**§ 178.103-2 Rated capacity.**

(b) The authorized maximum gross weight of the package is 350 pounds for sizes not over 55 gallons, or 480 pounds for sizes over 55 gallons but not over 110 gallons.

**§ 178.103-3 General construction requirements.**

(a) The outer shell must be of straight sided steel, with welded body seams and at least 18-gage body and bottom head



sheets, and 14-gage removable head sheets (unless there are one or more corrugations in the cover near the periphery, in which case 16-gage is authorized). The shell may be either a single sheet of steel or may be fabricated by welding together two appropriate lengths of 55-gallon drums, such as a DOT Spec. 6J or 17H, with rolled or swedged in hoops as prescribed for either of those specifications. The head must be convex (crowned), not extending beyond the level of the chime, with a minimum convexity of  $\frac{3}{8}$ -inch. The inside diameter of the shell must be at least 22.5 inches.

(b) Inner containment vessel must conform to Specification 2R (except that cast iron is not authorized), with a maximum usable inside dimension of 5.25 inches, maximum height of 50 inches (with caps in place) and minimum wall thickness of 0.25 inch.

(c) Inner containment vessel must be fixed within the outer shell by one of the following types of centering devices:

(1) At least 8 steel rod spacers, of at least 0.25 inch diameter (for packages of 55-gallon capacity) or 0.375 inch diameter (for packages with greater than 55-gallon capacity) cold rolled steel, welded to the vessel at each end by minimum 2-inch continuous weld. Each rod must be welded to the vessel at radial positions not exceeding 45 degrees as not to interfere with closure of the inner vessel. Each spacer rod must extend at least 2.25 inches beyond the inner vessel at each end, then radially to the wall of the outer drum (to provide a springlike snug fit) and along the entire length of the wall of the outer drum. For a packaging of more than 55-gallon capacity, each spacer rod must be braced by welding a 0.25 inch by 2-inch steel plate to the spacer rod and the pipe with a continuous weld at each joint, the joints being located approximately halfway along the length of the drum.

(2) (i) 1 inch by 1 inch by  $\frac{1}{4}$ -inch steel angle iron.

(ii)  $1\frac{1}{4}$  inches by  $1\frac{1}{4}$  inches by  $\frac{3}{16}$ -inch steel angle iron.

(iii) 1 inch schedule 40 steel pipe.

(3) There must not be less than 2 spacer mechanisms for a packaging of 55-gallon capacity nor less than 3 spacer mechanisms for a packaging greater than 55-gallon capacity. Each spacer mechanism must consist of not less than 6 steel angles, pipe, or rod radial supports of at least 0.42 square inch cross-section. Each radial support must be welded at one end to the containment vessel by a continuous weld or to an inner steel band of at least  $\frac{1}{4}$ -inch by 1 inch by a continuous weld at radial positions not exceeding 60 degrees from the center of the package. The inner band, when used, must be welded to the inner containment vessel by at least 6 equally spaced 2-inch welds on each edge of the band. The opposite end of the radial support must be welded by a continuous weld to an outer steel band of at least  $\frac{1}{4}$ -inch by 1 inch. The outer steel band

must be welded to the outer shell by at least 6 equally spaced welds on each edge of the top band, such that the inner vessel is fixed at least 2.25 inches from the top and bottom of the drum. The spacer mechanism must be welded as specified near each end of the containment vessel so as not to interfere with the vessel closure. For a packaging greater than 55-gallon capacity, the additional spacer mechanism must be located at approximately mid-point along the length of the inner vessel.

(d) The void between the inner containment vessel and the outer shell must be completely filled with bagged or tamped vermiculite (expanded mica), with a density of at least 4.5 pounds per cubic foot. Loose, untamped vermiculite is not authorized.

§ 178.103-4 Welding.

Welding must be of material having a melting point in excess of 1475° F. (except that for packages constructed prior to (effective date of this amendment), this temperature may be 1000° F.), with a joint efficiency of at least 0.85.

§ 178.103-5 Closure.

(a) The outer drum closure must be at least a 12-gage bolted ring with drop forged lugs, one of which is threaded, and having at least a  $\frac{5}{16}$ -inch diameter steel bolt, and a lock nut, or equivalent device.

In § 178.104, paragraphs (a), (b), and (c) in § 178.104-3 would be amended, and paragraph (e) would be added to read as follows:

§ 178.104 Specification 6M; metal packaging.

§ 178.104-3 General construction requirements.

(a) The outer shell must be of straight-sided steel, with welded body seams, and may be either a single sheet of steel, or for the 110-gallon size may be fabricated by welding together two appropriate lengths of 55-gallon drums, such as a DOT Spec. 6C or 17C, with each length to contain 3 wedged or rolled rolling hoops as prescribed for either of these specifications. A removable head for a packaging of 55 gallons or larger volume must have one or more corrugations in the cover near the periphery. For a packaging exceeding 15 gallons volume, the head must be crowned (convexed), not extending beyond the level of the chime, with a minimum convexity of  $\frac{3}{8}$ -inch.

(1) The maximum authorized gross weight, metal thickness, and minimum end insulation thickness for the marked volume is as follows:

Marked capacity (gallons not over)	Maximum authorized gross weight (pounds)	Minimum thickness of uncoated sheets and heads (gage)	Minimum thickness of end insulation (inches)
15	160	20	1.88
30	480	18	3.75
55	640	16	3.75
110	640	16	3.75

(2) Each drum must have at least four 0.5-inch diameter vent holes, located on the sides of the drum, near the top, each covered with a weatherproof tape, fusible plug, or equivalent device.

(b) Inner containment vessel must conform to Specification 2R or equivalent, with maximum usable inside diameter of 5.25 inches, minimum usable inside diameter of 4 inches, and minimum height of 6 inches.

(c) Inner containment vessel must be fixed within the outer shell by one of the following types of solid centering media:

(1) Machined discs and rings made of solid industrial cane fiberboard having a density of at least 15 pounds per cubic foot; fitted such that the clearances between the fiberboard, inner vessel, and shell do not exceed  $\frac{1}{4}$ -inch; or

(2) Hardwood or plywood at least  $\frac{1}{2}$ -inch thick, having a density of at least 28 pounds per cubic foot. The sides of the inner vessel must be protected by at least 3.75 inches of insulation media, and the ends with at least the thickness as prescribed in § 178.104-3(a)(1). There must be no gap or direct heat path from the shell to the inner vessel.

(e) For a packaging having an authorized gross weight in excess of 480 pounds, a steel bearing plate, at least 0.25 inch thick, and at least 10 inches in diameter must be provided at both ends and adjacent to the specification 2R inner containment vessel, to provide additional load-bearing surface against the insulation-centering medium.

§ 178.120 would be added to read as follows:

§ 178.120 Specification 20PF phenolic-foam insulated, metal overpack.

§ 178.120-1 General requirements.

(a) Each overpack must meet all of the applicable requirements of § 178.24 of this subchapter.

(b) The maximum gross weight of the package, including the inner cylinder and its contents, must not exceed the following:

- (1) Spec. 20PF-1—300 pounds.
- (2) Spec. 20PF-2—700 pounds.
- (3) Spec. 20PF-3—1000 pounds.

(c) The general configuration of the overpack must be a right cylinder, consisting of an insulated base section, a steel liner lid, and an insulated top section. The inner liner and outer shell must be at least 16-gage and 18-gage steel, respectively, with the intervening cavity filled with a molded-in-place, fire-resistant, phenolic-foam insulation interspersed with wooden members for bracing and support. Wood pieces must be securely attached to both the liner and shell. No hole is permitted in the liner. Each joint between sections must be stepped a minimum of 2 inches and gaps between mating surfaces must not exceed 0.2 inch. Gaps between foam surface of top section and liner lid must not exceed 0.4 inch, or 2 inches where taper is required for mold stripping. For the Spec. 20PF-1, the top section may consist of a plug of foam insulation and a



steel cover. The liner and shell closures must each be gasketed against moisture penetration. The liner must have a bolted flange closure. Shell closure must conform to § 178.117-8(b).

(d) Drawings in CAPE-1662, which include bills of material are a part of this specification.

**§ 178.120-2 Materials of construction and other requirements.**

(a) Phenolic foam—Insulation must be fire-resistant, phenolic foam which has been fabricated in accordance with USAEC Material and Equipment Specification SP-9, which is a part of this specification. A 5-inch minimum thickness of foam must be provided over the entire liner except:

- (1) Where wood spacers replace the foam; or
- (2) At protrusions of liner or shell, such as flanges, baffles, etc., where minimum insulation thickness is 3.5 inches; or

(3) Where alternate top section (Spec. 20PF-1) is used. Foam must not interfere with proper seating of screws in inner liner flange assembly. Average density of insulation must be 8 pounds per cubic foot (pcf) minimum for bottom section and 10 pcf minimum for top section, except 6.5 pcf for the Spec. 20PF-1 top section.

(b) Gaskets must be as follows:

(1) Inner liner flange—Neoprene rubber of 30 to 60 type A durometer hardness or other equivalent gasket material which is compatible with the specific contents.

(2) Outer shell—Synthetic rubber conforming to MIL-R-6855, (available from the Naval Publications Forms Center, 5801 Tabor Avenue, Philadelphia, Pennsylvania 19120) Class 2, grade 60.

(3) Support and pressure pads for inner liner top and bottom must be sponge rubber or equivalent.

(c) Alternate top section (Spec. 20PF-1 only). Average insulation density must be 10 pcf minimum. Thickness of plug must be 4.3 inches minimum, except thickness may be reduced to 4 inches to clear bolt heads. A flush mounted top lifting device must be securely fastened to a wood block encapsulated by the foam.

(d) Vent holes (0.2 inch diameter) must be drilled in the outer shell to provide pressure relief during the insulation foaming and in the event of a fire. These

holes, which must be drilled in all areas of the shell which mate with the foam insulation, must be spaced in accordance with CAPE-1662.

(e) Welding must be by a fusion welding process in accordance with American Welding Society Codes B-3.0 and D-1.0. Body seams and joints for the liner or shell must be continuous welds.

(f) Waterproofing—Each screw hole in the outer shell must be sealed with appropriate resin-type or equivalent sealing material during installation of the screw. All exposed foam surfaces, including any vent hole, must be sealed with water-proofing material as prescribed in USAEC Spec. SP-9, Rev. 1, or equivalent.

**§ 178.120-3 Tests.**

(a) Leakage test—Each inner liner assembly must be tested for leakage prior to installation. Seam welds of the liner must be covered for a distance of at least 6 inches on either side of the seam with

soapsuds, heavy oil, or equivalent material, and interior air pressure applied to at least 15 p.s.i.g. Pressure must be held for at least 30 seconds. Liners failing to pass this test may not be used until repairs are made, and retests successfully passed.

**§ 178.120-4 Required markings.**

(a) Marking must be as prescribed in § 173.24 of this subchapter.

(b) Marking on the outside of each overpack must be as follows:

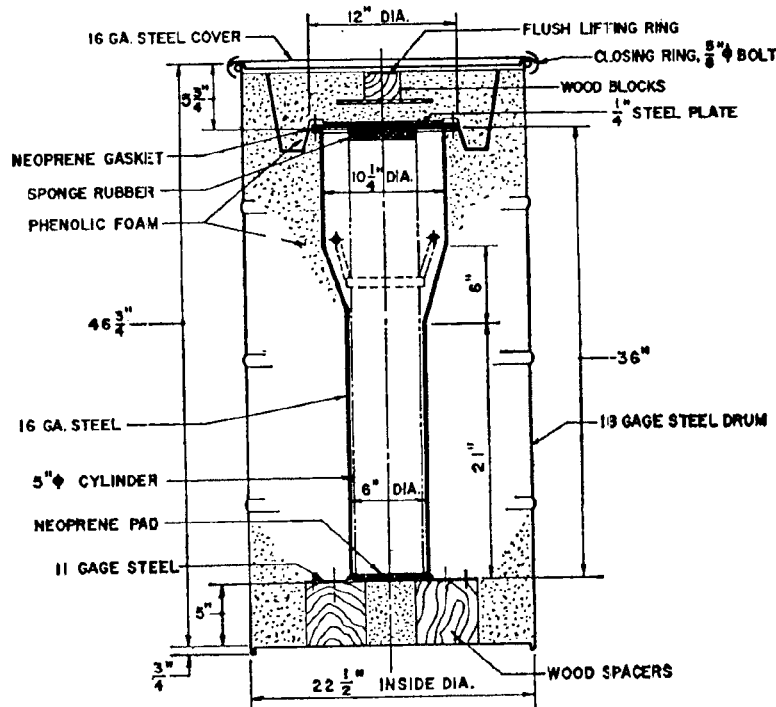
(1) "USA-DOT-20PF-1" or "-2," as appropriate, and if the entire liner is made of stainless steel, additional marking such as "304L-SS" to indicate the type of stainless steel used.

(2) "TARE WT: xxxlbs." where xxx is the tare weight of the assembled overpack without the inner container.

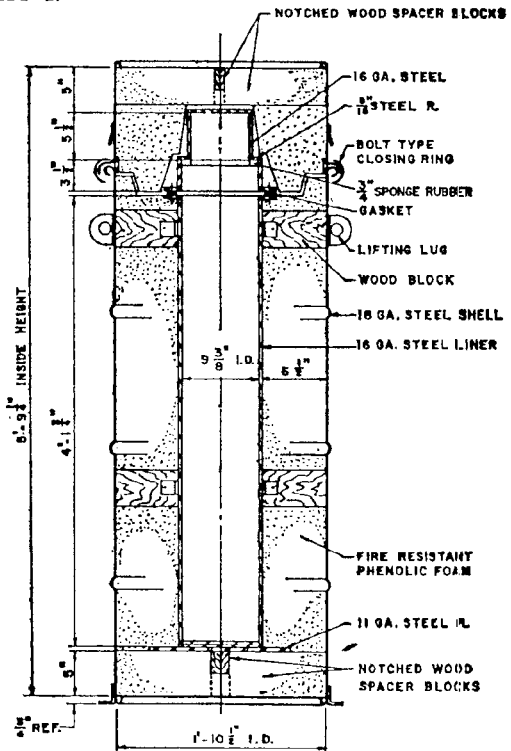
(3) Year of manufacture.

**§ 178.120-5 Typical assembly detail.**

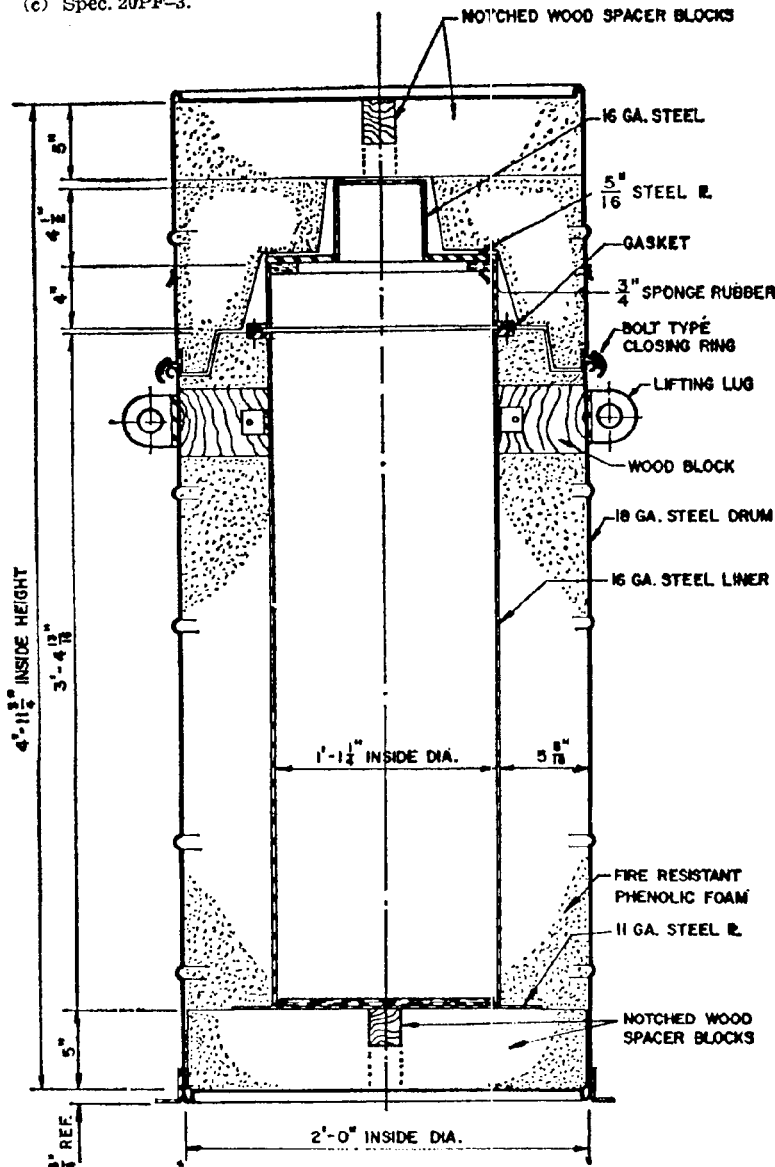
(a) Spec. 20PF-1.



(b) Spec. 20PF-2.



(c) Spec. 20PF-3.



§ 178.121 would be added to read as follows:

§ 178.121 Specification 21PF fire and shock resistant, phenolic-foam insulated, metal overpack.

§ 178.121-1 General requirements.

(a) Each overpack must meet all of the applicable requirements of § 173.24 of this subchapter.

(b) Each overpack is authorized for use in applications where the maximum gross weight of the package, including the inner container and contents does not exceed 8,200 pounds (horizontally-loaded spec. 21PF-1 unit), or 8,600 pounds (end-loaded spec. 21PF-2 unit).

(c) The general configuration of the

overpack must be a right cylinder, consisting of a steel inner liner (at least 16-gauge) and steel outer shell (at least 14-gauge) with the intervening cavity filled with a molded-in-place, fire resistant, phenolic foam insulation and interspersed wooden members for bracing and support. Two specific configurations are authorized; a horizontal loading unit (spec. 21PF-1) consisting of insulated base and top sections jointed in a longitudinal peripheral closure joint; or an end-loading unit (spec. 21PF-2), consisting of an insulated main section, a steel plate liner lid, and an insulated end cap. For either type each joint between sections must be stepped at least 0.75 inch and gaps between mating surfaces may

not exceed 0.2 inch. Bolted closures, which must each be gasketed against moisture penetration, must be in accordance with CAPE-1662. Each bolt must be equipped with a locking device to prevent loosening from vibration. Outer steel bracing and support framework must be attached to the shell to facilitate normal handling.

(d) Drawings in CAPE-1662, which include bills of material, are a part of this specification.

§ 178.121-2 Materials of construction and other requirements.

(a) Phenolic foam—Insulation must be fire resistant, phenolic foam which has been fabricated in accordance with USAEC material specification SP-9, Rev. 1, which is a part of this specification. A 5.5 inch minimum thickness of foam must be provided over the entire liner, except where:

- (1) Wood spacers replace the foam material; or
- (2) At protrusions of liner or shell, such as flanges, baffles, etc., where the minimum thickness of foam, wood, or a combination of these is 4 inches.
- (3) Solid wood or laminated wood solidly glued may be used to replace the foam between liner and shell (i.e., in ends of overpack). In this case, minimum wood thickness is 4 inches. Average density of insulation must be 6.75 pounds per cubic foot (pcf) minimum, except that 8 pcf is required in the removable end cap of the spec. 21PF-2, which must have a minimum foam thickness of 5 inches.

(b) Gaskets for inner liner, outer shell, or where otherwise specified in CAPE-1662, must be of vinyl foam tape, single coated, or 1/4-inch thick expanded rubber, per ASTM D1056, type R or S, grades 41 to 43, with adhesive backing, or equivalent.

(c) Support and pressure pads for the inner liner must be of neoprene, sponge rubber, or equivalent.

(d) Fire retardant (intumescent) paint must be applied to any wood blocking which is located at any joint in the shell.

(e) Vent holes (0.2 inch diameter) must be drilled in the outer shell to provide pressure relief during the insulation foaming and in the event of a fire. These holes, which must be drilled in all areas of the shell which mate with the foam insulation, must be spaced in accordance with CAPE-1662.

(f) Welding must be by a fusion process in accordance with the American Welding Society Code. Body seams and joints for the liner and shell must be continuous welds.

(g) Waterproofing—Each screw hole in the outer shell must be sealed with appropriate resin-type or equivalent sealing material during installation of the screw. All exposed foam surfaces including any vent hole, must be sealed with waterproofing material as prescribed in USAEC Material and Equipment Specification SP-9, or equivalent.

§ 178.121-3 Required markings.

(a) Markings must be as prescribed in § 173.24 of this subchapter.

(b) Marking on the outside of each overpack must be as follows:

(1) "USA-DOT-21PF-1" or "-2", as appropriate, and, if the inner shell is of stainless steel, additional marking such

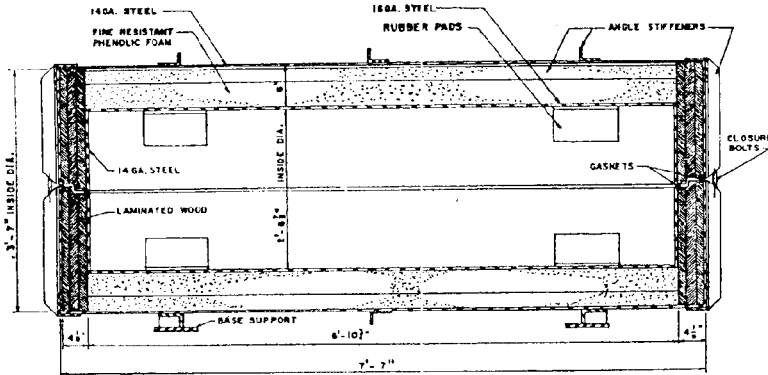
as "304L-SS" to indicate the type of stainless steel used.

(2) "TARE WT: xxx lbs." where xxx is the tare weight of the assembled overpack without the inner container.

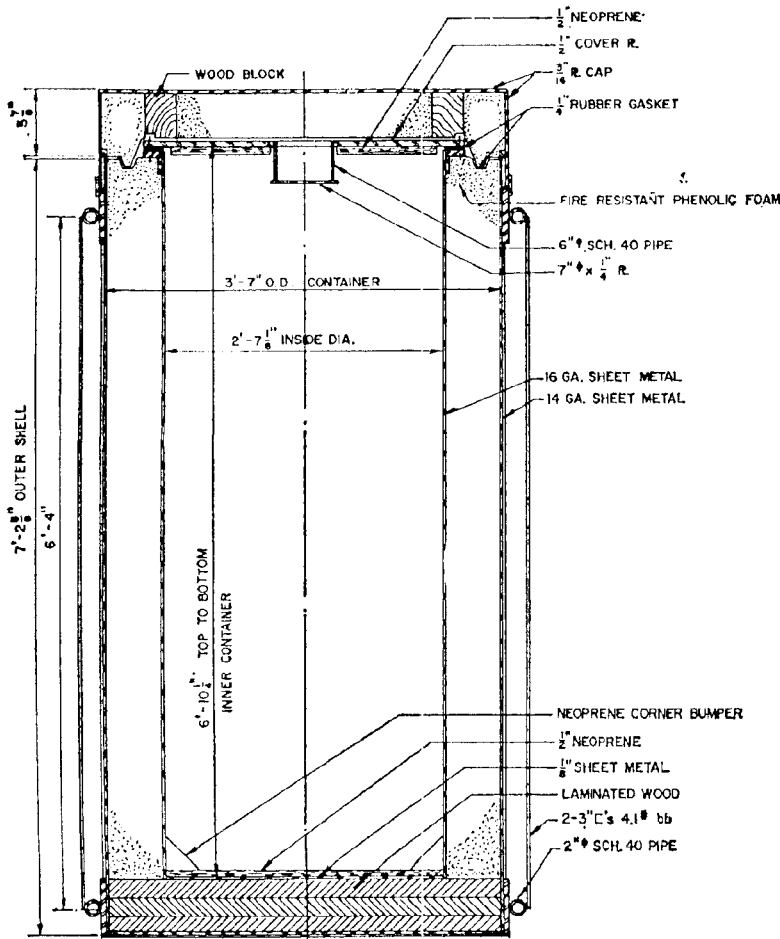
(3) Year of manufacture.

§ 178.121-4 Typical assembly detail.

(a) Spec. 21PF-1 (horizontal loading overpack).



(b) Spec. 21PF-2 (end loading overpack).



§ 178.194 would be added to read as follows:

§ 178.194 Specification 20WC wooden protective jacket.

§ 178.194-1 General requirements.

(a) Each jacket must meet the applicable requirements of § 173.24 of this subchapter.

(b) Maximum gross weight of the jacket plus the contents may not exceed the following:

- (1) Spec. 20WC-1: 500 pounds.
- (2) Spec. 20WC-2: 500 pounds.
- (3) Spec. 20WC-3: 1,000 pounds.
- (4) Spec. 20WC-4: 2,000 pounds.
- (5) Spec. 20WC-5: 4,000 pounds.
- (6) Spec. 20WC-6: 6,000 pounds.

§ 178.194-2 Materials of construction.

(a) The general configuration of the wooden protective jacket must be a hollow cylindrical shell constructed of one-piece discs and rings of plywood or solid hardwood reinforced with steel rods.

(1) The spec. 20WC-2 must be additionally completely encased, snugly fit within an 18-gage steel shell. The steel shell must be provided with at least four 0.25 inch diameter vent holes. Each hole must be covered with durable weatherproof tape, or equivalent device.

(2) The spec. 20WC-6 jacket must be additionally completely encased, snugly fit, within a 12 gage steel shell. The steel shell must be provided with at least twelve 0.5 inch diameter vent holes, located in 3 rows of 4 holes each, spaced at 90° intervals near the top, middle, and bottom of the drum. Each hole must be covered with durable weatherproof tape or equivalent device.

(b) Plywood must be exterior-grade void-free, Douglas fir (or equivalent) not more than 1 inch thick. Solid hardwood is authorized for spec. 20WC-1 only.

(c) Discs and rings must be glued together with a strong, shock-resistant adhesive, such as either of the following

- (1) A resorcinol-formaldehyde adhesive, which has been bonded under both heat and pressure; or
- (2) A polyvinyl-acetate emulsion which has been reinforced with cement coated nails. The nails must be randomly spaced and must be at least 2.5 times as long as the minimum thickness of the plywood discs or rings.

(d) Full-length steel rods are required for reinforcement and lid closure.

(1) The minimum number of rods and the minimum rod diameter are as shown in the following table:

Specification	Minimum number of rods	Minimum rod diameter (inches)
20WC-1	6	0.25
20WC-2	6	0.25
20WC-3	12	0.37
20WC-4	16	0.37
20WC-5	16	0.50
20WC-6	16	0.50

(2) For specs. 20WC-1 and 20WC- steel rods must be equally spaced around the circumference to the rings and discs midway between the O.D. and I.D. o

the rings. For specs. 20WC-3 and 20WC-4, bolts may be staggered alternately in two rows, at  $\pm 0.5$  inch from the line midway between the O.D. and I.D. of the rings. For specs. 20WC-5 and 20WC-6, bolts may be staggered alternately in two rows at  $\pm 1$  inch from the line midway between the O.D. and I.D. of the rings.

(3) Rod ends must be threaded and secured with lock nuts and steel washers, or equivalent device, to provide at least a 1 inch diameter bearing surface on each end. Ends of the rods must terminate 0.75 inch below the surface of the plywood for specs. 20WC-1 and 20WC-2. For specs. 20WC-3, 20WC-4, 20WC-5, and 20WC-6, the ends of the rods must terminate 1.5 inches below the surface of the plywood, and that portion of each end disc which extends beyond the rod ends must be further held in place with lag screws at least 4 inches long.

(e) Thickness of wooden shell:

(1) Spec. 20WC-1: At least 4 inches thick.

(2) Spec. 20WC-2: At least 3 inches thick.

(3) Spec. 20WC-3: At least 5 inches thick for the jacket wall, and at least 6 inches thick for the end discs. In addition, at least 3 plywood chines, 2 inches wide and protruding 2 inches beyond the outer surfaces, must be located at each end and midway along the length of the jacket.

(4) Spec. 20WC-4: At least 6 inches thick for the jacket wall, and at least 6 inches thick for the end discs. In addition, at least 3 plywood chines, 2 inches wide and protruding 2 inches beyond the outer surfaces, must be located at each end and midway along the length of the jacket.

(5) Specs. 20WC-5 and 20WC-6: At least 6 inches thick for the jacket wall, and at least 8 inches thick for the end discs. In addition, at least 5 plywood chines, 2 inches wide and protruding 2

inches beyond the outer surfaces, must be located at each end and equally spaced along the length of the jacket.

§ 178.194-3 Closure.

(a) Closure for the wooden protective jacket is provided by the steel reinforcing rods. The end cap (lid) must fit tightly to the body of the jacket to prevent a heat path to the inside of the jacket. The lid joint for specs. 20WC-3, 20WC-4, 20WC-5, and 20WC-6, may not be coplanar with the end of the inner containment vessel.

(b) Specs. 20WC-2 and 20WC-6. Locking ring closure, if used, must conform to § 178.104-4. Flanged closure, if used, must have at least 8 steel bolts (at least 0.25 inch diameter for 20WC-2 or 0.50 inch diameter for 20WC-6) and lock nuts (or equivalent device), spaced not more than 5 inches between centers.

§ 178.194-4 Tests.

Prior to each use, each jacket must be visually inspected for defects such as improper bonding, cracking, corrosion of steel rods, an improperly fitting closure lid, or other manufacturing defects. Particular attention must be given to any separation of the plywood discs and rings which would provide a heat path to the inside of the jacket.

§ 178.194-5 Painting.

Each jacket (other than 20WC-2 and 20WC-6) must be completely painted with a high quality exterior weather resistant paint.

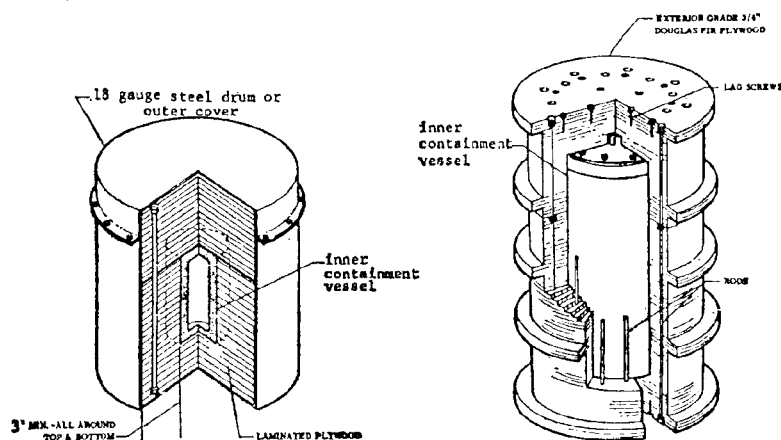
§ 178.194-6 Marking.

Each jacket must be marked on the external surface as follows: "USA-DOT 20WC-( ) TYPE B." The appropriate numeral must be inserted in the marking to indicate the appropriate spec. 20WC category: e.g., "20WC-2."

§ 178.194-7 Typical assembly sketches.

(a) Spec. 20WC-2.

(b) Spec. 20WC-5.



§ 178.185 would be added to read as follows:

§ 178.195 Specification 21WC wooden-steel protective overpack.

§ 178.195-1 General requirements.

(a) Each jacket must meet all the applicable requirements of § 173.24 of this subchapter.

(b) The maximum authorized gross weight of the overpack, including its inner container and contents may not exceed 3000 pounds.

§ 178.195-2 Materials of construction and other requirements.

(a) The general configuration of the protective overpack must be a combination of two nested plywood boxes, each 1 inch thick, nested within a third wooden box of nominal 2-inch thickness solid hardwood. The three nested boxes must be enclosed within a welded solid framework constructed of mild steel strap, nominally  $\frac{3}{8}$ -inch thick by  $\frac{3}{4}$ -inch wide. All outer surfaces of each box must be coated with intumescent paint.

(b) Plywood must be exterior-grade, void-free, Douglas fir, or equivalent, at least 1 inch thick. Solid hardwood must be maple, or equivalent.

(c) All box joints and interior surfaces must be glued with a strong, shock-resistant adhesive, such as polyvinyl-acetate emulsion, or equivalent.

(d) All hardwood joints must be mitered, or equivalent, reinforced with No. 10 cement-coated nails spaced on nominal 6-inch centers.

(e) All plywood joints must be butt-type, or equivalent, reinforced with No. 10 cement-coated nails spaced on nominal 6-inch centers.

(f) The angles and strapping of the metal frame must be spaced such that separation distances do not exceed 6 inches.

(g) The lid must be of the same material as the box and fabricated in such a manner that closure forms a mitered joint with the hardwood box and 2 stepped-joints with the plywood boxes.

§ 178.195-3 Closure.

Closure for the protective overpack must be provided by at least 4 mild steel hinges formed from minimum 1 inch x  $\frac{3}{16}$ -inch bar stock. Hinge pins must be minimum  $\frac{1}{4}$ -inch diameter by  $5\frac{1}{4}$  inches long mild steel rod drilled at both ends for cotter pins.

§ 178.195-4 Tests.

Prior to each use, each overpack must be visually inspected for defects such as wood checking or splintering, weld cracking, corrosion of steel parts, improper joint bonding, or improperly fitting closure lid.

§ 178.195-5 Required marking.

(a) Marking must be as prescribed in § 173.24 of this subchapter.

(E) Marking on the outside of each overpack must include the following:

(1) "USA-DOT 21WC" and "TYPE B" as appropriate.

§ 178.250 [Deleted]

§ 178.250 would be deleted.

Interested persons are invited to give their views on this proposal. Communications should identify the docket number and be submitted in duplicate to the Secretary, Hazardous Materials Regulations Board, Department of Transportation, Washington, D.C. 20590. Communications received before January 15, 1973, will be considered before final action is taken on the proposal. All comments received will be available for examination by interested persons at the Office of the Secretary, Hazardous Materials Regulations Board, room 6215 Buzzards Point Building, Second and V Streets, S.W., Washington, D.C. both before and after closing date for comments.

(Secs. 831-835 of Title 18, United States Code, section 9 of the Department of Transportation Act (49 U.S.C. 1657), title VI and section 902(h) of the Federal Aviation Act of 1958 (49 U.S.C. 1421-1430, 1472(h), and 1655 (c)).)

Issued in Washington, D.C., on October 11, 1973.

W. J. BURNS,  
*Director,*

*Office of Hazardous Materials.*

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