



Department of Energy
Washington, D.C. 20585

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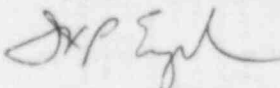
NR:RM:PJWindley S#85-1328
July 3, 1985

C. E. MacDonald
Chief, Transportation Certification Branch
Nuclear Regulatory Commission
Washington, D. C. 20555

WAPD-40 SHIPPING CONTAINER FOR IRRADIATION TEST SPECIMENS - DOE
CERTIFICATE OF COMPLIANCE; FORWARDING FOR INFORMATION

Nuclear Regulatory Commission (NRC) memorandum FCTC:RHO 71-5874 dated May 31, 1985 forwarded the NRC Certificate of Compliance for the WAPD-40 shipping container. Naval Reactors has issued a DOE Certificate of Compliance for the WAPD-40 shipping container. The new DOE certificate has been modified to delete unneeded references to outside documents and drawings and now references only the Safety Analysis Report for Packaging (SARP) and the WAPD-40 drawings. The list of inner container drawings has been deleted. The list of approved inner containers will be maintained separately by Bettis Atomic Power Laboratory. Further, the certificate allows the methods used to calculate the maximum permissible radiation level on the containers side for a U²³⁵ cargo to be used for U²³³ cargoes as well.

A copy of the DOE certificate is attached as Enclosure (1). Enclosure (2) indicates that use of the F Factors in the DOE certificate is conservative when applied to U²³³ cargoes as well as U²³⁵ cargoes. NR evaluation has concluded that these changes do not affect compliance of the WAPD-40 shipping container with 10 CFR 71. It is requested that a revised NRC certificate of compliance for this container consistent with enclosure (1) be forwarded.


W. P. ENGEL
Naval Reactors

Enclosures: (1) Department of Energy Certificate of Compliance
USA/5874/B()F (DOE-NR), Rev. 3 dated July 1, 1985
(2) Table for U²³³ Shipments

CC:

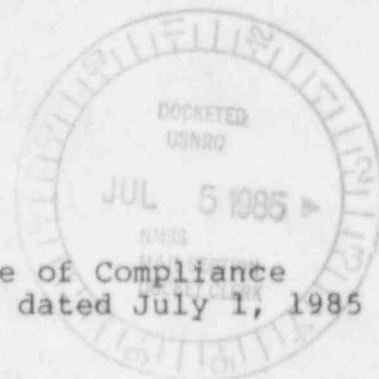
C. E. MacDonald (NRC) 2 copies with enclosure
R. Garrison, DOE (w/o enclosure)
Manager, PNRO (w/o enclosure)
Manager, Shipping Container Analysis, Bettis (w/o enclosure)

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PDR ADOCK 07105874
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DOCKET NO. 71-5874
CONTROL NO. 25480
DATE OF DOC. 07/03/85
DATE RCVD. 07/05/85
FCUF _____ PDR ☒
FCAF _____ LPDR _____
WM _____ I&E REF. ☒
WMUR _____ SAFEGUARDS _____
FCTC ☒ OTHER _____

DESCRIPTION:

enclosed is a
Copy of Certificate
of Compliance and
Table for U 233
Shipments
07/05/85 INITIAL CAC

U.S. DEPARTMENT OF ENERGY
CERTIFICATE OF COMPLIANCE
For Radioactive Materials Packages

1a. Certificate Number USA/5874/B()F (DOE-NR)	1b. Revision No. 3	1c. Package Identification No. USA/5874/B()F (DOE-NR)	1d. Page No. 1	1e. Total No. Pages. 4
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2. PREAMBLE

- 2a. This certificate is issued under the authority of 49CFR Part 173.7 (d).
- 2b. The packaging and contents described in item 5 below, meets the safety standards set forth in subpart E, "Package Approval Standards" and subpart F, "Package and Special Form Tests" Title 10, Code of Federal Regulations, Part 71.
- 2c. This certificate does not relieve the consignor from compliance with any requirement of the regulations of the U.S. Department of Transportation or other applicable regulatory agencies, including the government of any country through or into which the package will be transported.

3. This certificate is issued on the basis of a safety analysis report of the package design or application —

(1) Prepared by (Name and address):

Bettis Atomic Power Laboratory
P. O. Box 79
Pittsburgh, PA 15122-0079

Attn: Mgr., Shipping
Container Analysis

(2) Title and Identification of report or application:

Safety Analysis Report for
Packaging for the WAPD-40
Shipping Container
(WAPD-REC(C)-270 dated August, 1981
as revised)

(3) Date:

August 1981

4. CONDITIONS

This certificate is conditional upon the fulfilling of the applicable Operational and Quality Assurance requirements of 49CFR parts 100.199 and 10CFR Part 71, and the conditions specified in item 5 below.

5. Description of Packaging and Authorized Contents, Model Number, Fissile Class, Other Conditions, and References.

WAPD-40 Radioactive Materials Shipping Container

a. Description:

The WAPD-40 shipping container is an cylindrical, stainless steel clad, lead shielded, shipping container used to ship irradiated fuel and non-fuel test specimens. The container has an outer 304L stainless steel shell 1/2-inch thick and an inner 304L stainless steel shell 1/4-inch thick, with 10 inches of lead between the shells. The overall size of the container, including an integral skid, is 24 inches in diameter by 168 inches in length. Gross weight (including skid) of the container is approximately 27,500 pounds. The heat removal capacity is approximately 2000 BTU/hr. The cylindrical inner cavity is 2 inches in diameter and 135 inches in length. Inner containers are required for all shipments (see Item 5.c.(4), below). Stainless steel clad, lead shielded end plugs bolt into each end. One-half inch thick plates are bolted over the end plugs to provide a total end plug flange thickness of 1.0 inch for puncture resistance. Metallic, pressure-filled o-rings between the end plugs and the container seal the package. A special hold-down cradle is used during truck shipments. This cradle weighs

6a. Date of Issuance July 1, 1985

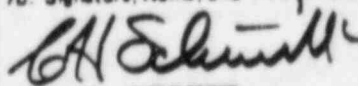
6b. Expiration Date August 31, 1990

FOR THE U.S. DEPARTMENT OF ENERGY

7a. Address (of DOE Issuing Office)

Naval Reactors
Department of Energy
Washington, D.C.
20585

7b. Signature, Name, and Title (of DOE Approving Official)


C. H. SCHMITT
Deputy Director
for Naval Reactors

a. (continued)

approximately 5,000 pounds. The shipping container is constructed in accordance with the following Westinghouse Electric Drawings:

WAPD-40 Cask Assembly	936F577 (latest revision)
WAPD-40 Cask Details	936F578 (latest revision)

b. Authorized Contents

The authorized contents of the package consist of fissile and highway route controlled quantities of radioactive isotopic materials (including activated structural material, corrosion products, and mixed fission products) which shall be contained in inner containers.

Since the container contents must be less than 350 equivalent grams of U-235 (see Item 5.c.(1) below) it is approved as a Fissile Class II container with a minimum Transport Index of 3.2.

c. Restrictions

- (1) The fissile content of the shipping container shall be limited to 350 equivalent grams of U^{235} , where the number of equivalent grams of U^{235} is determined by the equation: $1 \times \text{grams } U^{235} + 1.4 \times \text{grams of } U^{233} + 1.6 \times \text{grams of plutonium}$.
- (2) The decay heat limit of the cargo being shipped is 200 BTU/hour/foot, up to a total of 2000 BTU/hour.
- (3) All shipments must be dry and unmoderated.
- (4) The radioactive contents of the package must be contained in approved, sealed inner containers. A list of approved inner containers is available from Manager, Shipping Container Analysis, Bettis Atomic Power Laboratory (See address in Item 3.(1) above).

During shipment, the inner cavity of the cask must be completely filled with inner containers, even if some of these inner containers are empty.

- (5) For ferrous alloys, inconel, and irradiated fuel, the contents of the container must be limited so that the maximum measured gamma dose rate (above background) on the side of the cask for normal conditions does not exceed the value defined by $C_S = (1000 - N_A)/F$.

where C_S = the maximum permissible gamma dose rate on the side of the cask in mrem/hour for normal conditions.

N_A = 00.0 mrem/hour for shipments of irradiated structural materials and 37.0 mrem/hour for shipments of irradiated fuel.

c. (continued)

F = factor obtained directly from Table 1 or Table 2. These tables are provided as attachments to this document.

For non-fuel whose principal isotope is not included in Table 1, an F factor must be determined based on calculated ratios of the limiting accident radiation levels to the normal condition radiation levels for each of the principal isotopes.

For U^{233} with approximately 30,000 hours of effective full power operation and greater than 17,520 hours of decay, the F factors in Table 2 for U^{235} are conservative and may be used.

The maximum measured neutron level dose rate on the side of the cask must not exceed 10.7 mrem/hour for normal conditions.

For mixed shipments of fuel and irradiated non-fuel, the more limiting C_S value must be employed.

If C_S is below the minimum measurable level of the gamma instrument, other methods (e.g., thermal luminescent detectors, source strength calculations) must be employed to estimate the expected level for comparison with C_S .

- (6) Use of the trunnions for cask tiedown is prohibited.
- (7) The cask must be tested for leaktightness within one year prior to use. Leaktightness is defined as leakage of 10^{-7} atm-cm³/sec or less.
- (8) Prior to each shipment, the cask must be leak tested after assembly. Acceptable leakage for this test will be 10^{-3} atm-cm³/sec or less.

d. References

WAPD-REO(C)-270 dated August 1981 as revised, Safety Analysis Report for Packaging for the Shipment of the WAPD-40 Shipping Container.

e. Additional Information

See Attachment (2 pages)

Table 1

F Factors ¹ For Use in Formula $C_S = (1000 - N_A)/F$
 For Irradiated Structural Material Shipments by
 Principal Isotope

<u>Isotope</u>	<u>Energy</u> MeV	and	<u>Yield</u> (\bar{s} /decay)	<u>Factor</u>
Manganese-56	0.47		0.99	174
	1.81		0.29	
	2.11		0.15	
Cobalt-60	1.17		1.0	1492
	1.33		1.0	
Iron-59	1.095		0.56	1875
	1.292		0.44	

¹The F factor is a constant for each isotope because the energy spectrum of the emitted gamma radiation of each isotope does not change as a function of time.

Table 2

F Factors For Use in Formula $C_S = (1000 - N_A)/F$
For Irradiated U²³⁵ Fuel Shipments

Effective Hours Full Power Operation	Hours Decay								
	720	1440	2160	4320	6480	8760	17,520	43,800	87,600
100	339	339	330	219	200	194	192	208	698
500	338	338	325	219	203	198	198	237	648
1000	338	337	318	219	206	203	206	268	629
5000	332	317	283	230	228	229	250	382	606
10,000	317	300	271	242	243	248	278	427	607
15,000	310	294	269	249	253	258	292	445	610
20,000	306	290	268	254	257	265	300	457	612
25,000	302	286	268	256	260	267	305	464	617
30,000	300	285	267	257	263	270	308	466	624
40,000	295	282	266	258	264	271	310	472	637
50,000	292	279	265	259	264	272	311	472	651

SHIELDING EVALUATION - Support Information

The following information is provided to show that the shielding analysis for U^{235} in a damaged WARD-40 shipping container is conservative for the proposed U^{233} contents. The results in the table represent the percentage change in the radiation level resulting from irradiated U^{233} fuel as compared with irradiated U^{235} fuel at approximately 30,000 effective full power hours of operation.

CHANGE IN RADIATION LEVEL

	Hours Decay		
	24,000	43,800	87,600
Normal Conditions	-13.5%	-13.0%	-9.0%
Accident Conditions	-11.0%	-10.0%	-7.0%

Based on the above table, use of the F Factors in the DOE certificate of compliance for U^{233} fuel as well as U^{235} fuel is conservative.