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PDR '71-6078

POWER SYSTEMS

License SNM-1067
Docket 71-6078

May 30, 1980

U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Mr. Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle & Material Safety

Reference: Letter from Mr. C. E. MacDonald to Mr. H. V. Lichtenberger, dated March 28, 1980; Certificate of Compliance No. 6078

Gentlemen:

This is in response to your request for revised drawings of the C-E Model 927A1 and 927C1 containers as part of our renewal application for Certificate of Compliance No. 6078 dated December 10, 1979. To preserve the continuity of our application, the drawings and associated changes are submitted in the form of revised pages to our original renewal application as listed below:

Delete Pages	Add Pages
1-1	1-1 Rev. 1, 5/30/80
1-2	1-2 Rev. 1, 5/30/80
Appendix 1.3-CE Drawing NFM-E-4108, Rev. 0 sheets 1 and 2 dated 11/27/79	Appendix 1.3-CE Drawing NFM-E-4108, Rev. 1, sheets 1-4 dated 5/29/80
2-4	2-4 Rev. 1, 5/30/80
4-1	4-1 Rev. 1, 5/30/80
8-1	8-1 Rev. 1, 5/30/80

Very truly yours,

H V Lichtenberger

H. V. Lichtenberger
Vice President-Nuclear Fuel
Nuclear Power Systems-Manufacturing

HVL/GAJ/ssb
Enclosures

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1. GENERAL INFORMATION

1.1 Introduction

This renewal application is submitted for approval of Combustion Engineering's fuel assembly shipping containers, identified as Model 927A1 and Model 927C1. The Model 927A1 container is structurally identical to the Model 927C1 container with the exception of its reduced length. These containers meet the criteria of 10 CFR Part 71.40(a) for shipment as Fissile Class III, with a limit of 8 packages per shipment.

1.2 Package Description

1.2.1 Packaging

The 927A1 and 927C1 containers are fabricated of carbon steel and consist of a strongback and fuel bundle clamping assembly, shock mounted to the steel outer container. The fuel bundles are separated by 1/4" thick, 6" x 6" x 8" high carbon steel spacer blocks bolted between the bundles to maintain a minimum bundle to bundle separation of 6 inches. The Model 927A1 container is approximately 43" in diameter by 189" long with an approximate gross weight of 6,200 lbs. The Model 927C1 container is approximately 43" in diameter by 216" long with an approximate gross weight of 7,000 lbs.

All safety-related features of both containers are described in CE Drawing * NFM-E-4108, Rev. 1, sheets 1-4, dated 5/29/80 which are included in Appendix 1.3 of this application. Drawings of pressure relief valves and lifting devices are also shown in Appendix 1.3 with material lists, dimensions, gaskets, and weld specifications included.

1.2.2 Operational Features

N/A (These containers are used for the shipment of unirradiated PWR fuel assemblies, are of relatively simple design and do not incorporate cooling systems, shielding, etc.)

1.2.3 Contents of Packaging

Each shipping container shall contain two fuel assemblies. Each fuel assembly shall be unsheathed or shall be enclosed in an unsealed, polyethylene sheath which will not extend beyond the ends of the fuel assembly. The ends of the sheath shall not be folded or taped in any manner that would prevent flow of liquids into or out of the sheathed fuel assembly.

The CE Model 927A1 package will contain two fuel assemblies consisting of 0.3765" diameter uranium dioxide pellets clad in .028" thick zircaloy-4 tubes in a 14 x 14 square array with a 0.58" pitch. Each fuel bundle consists of a maximum of 176 fuel rods enriched to a maximum of 4.1% U^{235}. The maximum radioactivity for each fuel bundle is 0.80 curies. The maximum for each loaded fuel container is 1.60 curies, with the maximum radioactivity for a shipment of eight containers or sixteen fuel bundles being 12.8 curies.

The CE Model 927C1 package will contain two fuel assemblies consisting of 0.325" diameter uranium dioxide pellets clad in .025" thick zircaloy tubes in a 16x16 square array with a .506" pitch. Each fuel bundle consists of a maximum of 236 fuel rods

enriched to a maximum of 4.1% U^{235}. The maximum radioactivity for each fuel bundle is 0.90 curies. The maximum for each loaded fuel container is 1.80 curies, with the maximum radioactivity for a shipment of eight containers or sixteen fuel bundles being 14.4 curies.

For both the Model No. 927A1 and 927C1 container, the upper bundle bracket may be secured to the strongback by either of the following hardwares:

(i) Ten 3/4-16 UNF Hex Head bolts with associated washers and nuts, or

(ii) Eight 3/4-inch diameter steel clevis pins with associated steel hair pin cotters, and two 3/4-16 UNF Hex Head bolts with associated washers and nuts. The two bolts shall be placed in the uppermost position for that specified part.

1.3 Appendix

Dimensional details of both containers are described in Drawing NFM-E-4108, * Rev.1, sheets 1-4 dated 5/29/80.

2.7 Hypothetical Accident Conditions

This package was subjected to the hypothetical accident conditions as specified in Appendix B to 10 CFR Part 71 and meets the standards specified in 71.36 of 10 CFR Part 71.

2.7.1 Free Drop

a) Analysis

The container was subjected to two 30-foot drops. The first drop was made with the longitudinal axis of the container at an angle of approximately 30° to the horizontal. The angle was such that the aft end of the container struck first, the container then rotating so that the bottom of the fore and skids hit the concrete slab. The container cover was removed at the test site after the 30° angle, 30-foot drop and the container visually inspected. The simulated fuel bundles were retained in the container cradle assembly and little relative movement of one fuel bundle with respect to the other was noted. The most notable deformation as a result of this test was in the skid brackets. See Appendix 2.10 Reference B. See photographs No. 6 through No. 17 for various views of the container during and after this test.

The second 30-foot drop was made with the container oriented such that the left side closure flange struck the concrete slab. The simulated load utilizing tubular construction was nearest the ground. Upon impact the container remained stable on its side without any rotation about its axis.

After the 30-foot side drop, the container was inspected as above. Although the simulated fuel bundles had shifted sidewise from their original mounting positions the fuel bundles did not come loose and were contained in the container shell after testing. The most notable deformation in the container shell is at the forward right closure flange. Refer to Appendix 2.10 reference B, photographs No. 18 through No. 30 for various views of the container during and after this test.

It is concluded that the container satisfies the test requirements by retaining the two fuel bundles within the strongback with complete separation of the two bundles. Further, the strongback with fuel bundles installed were contained within the container structure.

b) Prototype Testing

The testing was performed on the CE Model 927A1 container by Applied Design Co., in February 1969. The only major difference between the tested container and the existing container is the method of separating the fuel bundles. The boral plate in the original container has been replaced by carbon steel separator blocks. A structural analysis was performed and completed in February 1971 to show that the modified container was covered by testing performed on the original container. This analysis was then submitted and approved by the Commission. (See Appendix 2.10 reference C).

As previously mentioned, the CE Model 927C1 container is structurally identical to the tested 927A1 container except for its additional length.

* The Humidity Indicator and the Filling Valve are listed as optional on Drawing NFM-E-4108, Rev. 1, sheet 1, dated 5/29/80. (Appendix 1.3). These two features are not being utilized any longer and have been eliminated from some of the 927C1 containers.

4.0 CONTAINMENT

4.1 Containment Boundary

The primary containment of the CE Model 927A1 packages is the 11 gauge steel shell. The unirradiated UO_2 fuel pellets are placed within zircaloy fuel rods of approximately .025 inch thick walls. These fuel rods are then assembled into bundles.

4.1.1 Containment Vessel

The outer shell is composed of 11 gauge steel.

4.1.2 Containment Penetrations

There are a total of 5 penetrations into the primary containment. Of these, only 2 are presently needed. The remaining three are listed as optional and may be eliminated upon construction of any new containers.

Those which are no longer used are the Desiccant Access Hatch, Humidity Indicator, and the Filling Valve. The Humidity Indicator has been eliminated on the longer containers because of its lack of reliability. The filling valve has also been removed because the containers are no longer pressurized. The desiccant access hatch is still on all containers; however, the desiccant bags are presently placed in the container before the container is closed.

4.1.3 Seals and Welds

* All seals and welds are specified on Drawings NFM-E-4108, Rev. 1, sheets 1-4, dated 5/29/80.

4.1.4 Closure

The "T" Head Special-Bolt is presently being used for closure of the containers. It is requested that the Round Head Square Neck bolt shown in Appendix 2.10 be approved for closure of the containers also. The replacement bolt is equal to or greater than the "T" Head Special Bolt in mechanical properties.

4.2 Requirements for Normal Conditions of Transport

It is concluded that under normal conditions of transport (as specified in 10 CFR Part 71, Appendix A) the tests results described in Section 2.6 of this application indicate the following results:

(1) There will be no release of radioactive material from the containment vessel.

(2) The effectiveness of the packaging will not be reduced.

(3) There will be no mixture of gases or vapors in the container which could, through any credible increase of pressure or an explosion, significantly reduce the effectiveness of the package.

(4) The package is so designed and constructed, and its contents so limited, that under the normal conditions of transport specified in Appendix A of 10 CFR Part 71:

8. ACCEPTANCE TESTS AND MAINTENANCE PROGRAM

8.1 Acceptance Tests

All containers to be fabricated will be constructed in accordance with drawings NFM-E-4108, Rev. 1, sheets 1-4, dated 5/29/80 and shall be source inspected prior to leaving the vendor's facility. Changes to the design of the container which fall outside of the safety envelope specified in this application will be submitted to NRC for approval. This may include retesting of the container if analytical results are not capable of demonstrating that the test sequence previously performed would be applicable to the changes made.

8.2 Maintenance Program

The maintenance program uses the Quality Assurance inspection procedures to determine when any repair or replacement of material is required.

These inspections include:

a) Visual Inspection
   1) Container External Condition
   2) Container Internal Condition
   3) Cover Gaskets

b) Tests Performed
   1) Impact Records Tested
   2) Test of Manual Pressure Relief Valves

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

6/12/80

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