TEL. 203-688-1911

CABLE ADDRESS: COALBURN
WINDSOR, CONN.

COMBUSTION ENGINEERING, INC.

WINDSOR, CONNECTICUT 06095

License SNM-1067
Docket 70-1100
July 3, 1969

Mr. Donald A. Nussbaumer, Chief
Source & Special Nuclear Materials Branch
Division of Materials Licensing
U. S. Atomic Energy Commission
Washington, D. C. 20545

Dear Mr. Nussbaumer:

Combustion Engineering, Inc., requests that its Source & Special Nuclear Material License #SNM-1067 be amended to allow the use of its fuel bundle shipping container, identified as CE Model 927A, for delivery of the Palisades Fuel Bundles to a carrier for transport.

The application, necessary to substantiate the above request, is attached and identified as:

Exhibit P
Application for Licensing of
Combustion Engineering, Inc.
Shipping Container
Model 927A

The responses in Exhibit P correspond to the regulations as contained in 10-CFR-71.

In addition to the submission of Exhibit P, the following revisions to Combustion Engineering's Source & Special Nuclear Material License #SNM-1067 are also attached:

1. List of Exhibits -i- Revised June 12, 1969

   This page includes the addition of Exhibit P.

2. Exhibit O - Figure 1 - Page 5 - Revised June 12, 1969

   This page indicates that Radiation Monitor - Bldg. #21 is located on the inner East Wall rather than the inner West Wall as stated in the original application.

Your attention is directed to Applied Design Test Report No. 2312B, Reference C wherein reference is made to the Boral Plate within the strongback. These tests were made with the Boral Plate but it was subsequently modified to include the use of a Stainless Steel Plate in the strongback. Please refer to Combustion Engineering' application, dated June 4, 1969, which requested that Amendment #8 be revised to include the use of a Stainless Steel Separator.

Questions regarding this submission should be directed to the undersigned. In the event that there are any questions, please call collect (203-688-1911 - Ext. 574).

Very truly yours,

COMBUSTION ENGINEERING, INC.

T. B. Bowie

T. B. Bowie
Nuclear Materials Manager

TBB:saj

Enclosures

E X H I B I T S

A. Combustion Engineering, Financial Statement as of December 31, 1966

B. Map of Windsor and Surrounding Communities

C. Combustion Engineering Site Plan

D. Resumes

E. Nuclear Manufacturing Facility

F. Nuclear Material Management Organizational Chart

G. Health Physics Manual CEND-269

H. Safety Manual CEND-245

I. Nuclear Manufacturing Ventilation Scheme

J. Nuclear Manufacturing Monitoring System

K. Nuclear Manufacturing Criticality Areas

L. Nuclear Safety Analysis for Nuclear Manufacturing Facility

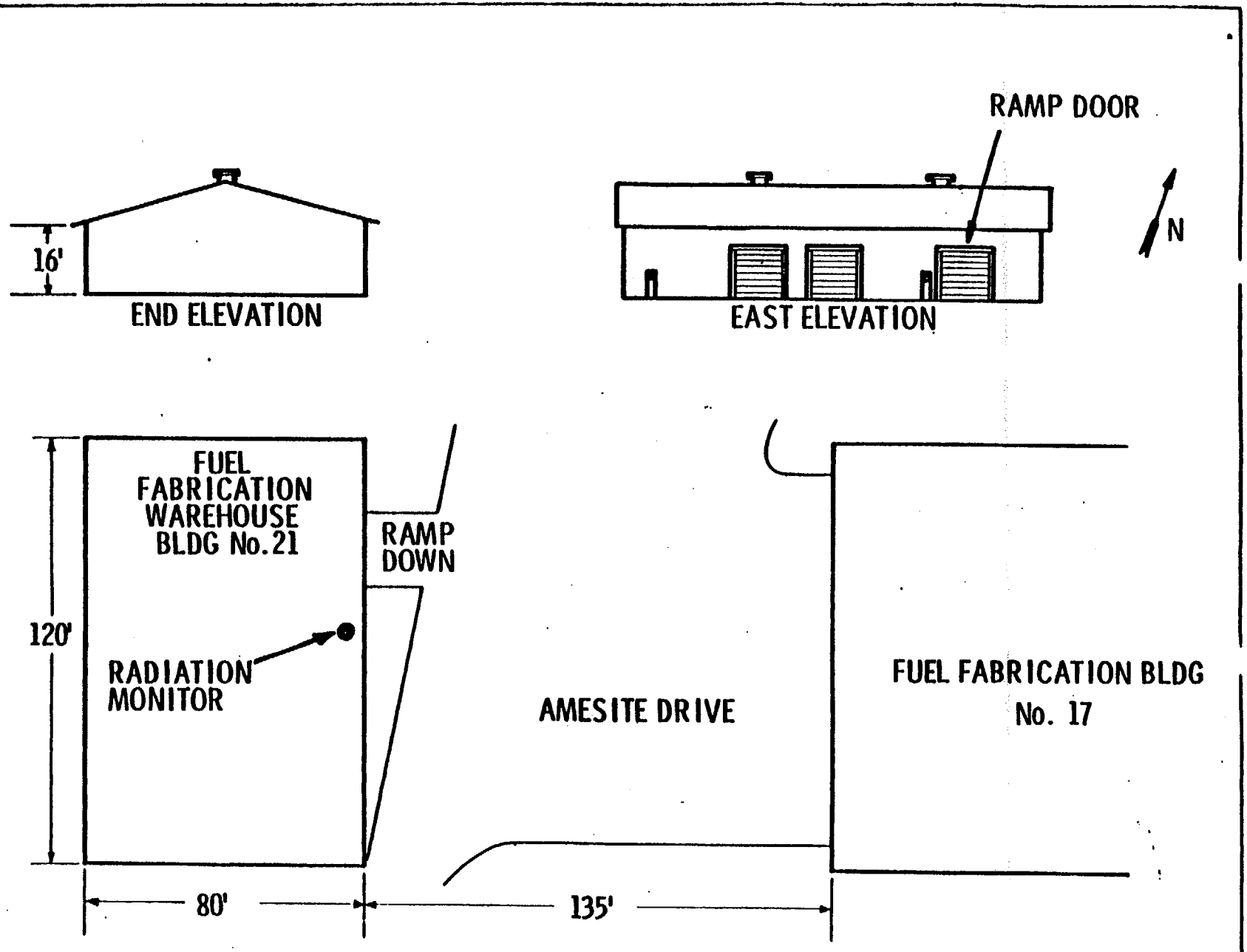
M. Non-Proprietary Nuclear Safety Analysis for Nuclear Manufacturing Facility

N. Nuclear Safety Analysis for the Movement of Transportation Carts, Work Stations 20 and 24A

O. Storage of Fuel Bundles and Fuel Pellets in The Nuclear Manufacturing Warehouse

P. Application for Licensing of Combustion Engineering, Inc. Shipping Container Model 927A

Revised June 12, 1969


Fuel Fabrication Warehouse
Building No. 21
COMBUSTION ENGINEERING, INC.
WINDSOR, CONNECTICUT
Figure
1
Revised 6-12-69
16'
END ELEVATION
RAMP DOOR
EAST ELEVATION
N
FUEL
FABRICATION
WAREHOUSE
BLDG No. 21
RAMP
DOWN
120'
RADIATION
MONITOR
AMESITE DRIVE
FUEL FABRICATION BLDG
No. 17
80'
135'

APPLICATION FOR SOURCE & SPECIAL NUCLEAR
MATERIAL LICENSE
SNM-1067
DOCKET 70-1100

Exhibit P

Application for Licensing of Combustion Engineering, Inc., Fuel Bundle Shipping Container Model: CE 927A

July 3, 1969

COMBUSTION ENGINEERING, INC.
Windsor, Connecticut

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

REFERENCES

Reference	Title
A.	Qualification Test Procedure For The Applied Design Company Model 927A Metal Shipping & Storage Container For Combustion Engineering, Inc. Fuel Bundle Assembly Test Report No. 2312A
B.	Test Report No. 2312B On The Applied Design Company Model 92A Metal Shipping & Storage Container For Combustion Engineering, Inc. Fuel Bundle Assembly
C.	Nuclear Safety Calculations for the Fuel Bundle Shipping Container Under Accident Conditions

71.22 Package Description

A. Package

(1) Gross Weight of Loaded Shipping Container is 6200 lbs.

(2) Model Number - 927A

(3) The shipping container is made of carbon steel and is described in the following documents:

1. Combustion Engineering Drawing Number 2966-D-3245, Isometric Drawing of Fuel Bundle Shipping Container (Figure I).
2. Combustion Engineering Drawing Number 2966-B-3660, Detailed Drawing of Fuel Bundle Shipping Container (Figure II).
3. Applied Design Drawing Numbers:

   927 A1, sheets 1, 2 and 3;
   927 A2, sheet 2;
   927 A3;
   927 A4
   927 A99 (Figures III-IX)
4. Applied Design Drawing SP-371-P (Figure X)
5. Applied Design Drawing SP-371-N (Figure XI)

(4) Receptacles

The containment vessel for the two (2) fuel bundles is the 43 in. diameter outer shell of the shipping container.

(5) A type 304 stainless steel plate between the two (2) fuel bundles is used as a neutron absorber. The stainless plate is 1/4 in. thick, 10 in. high and full length.

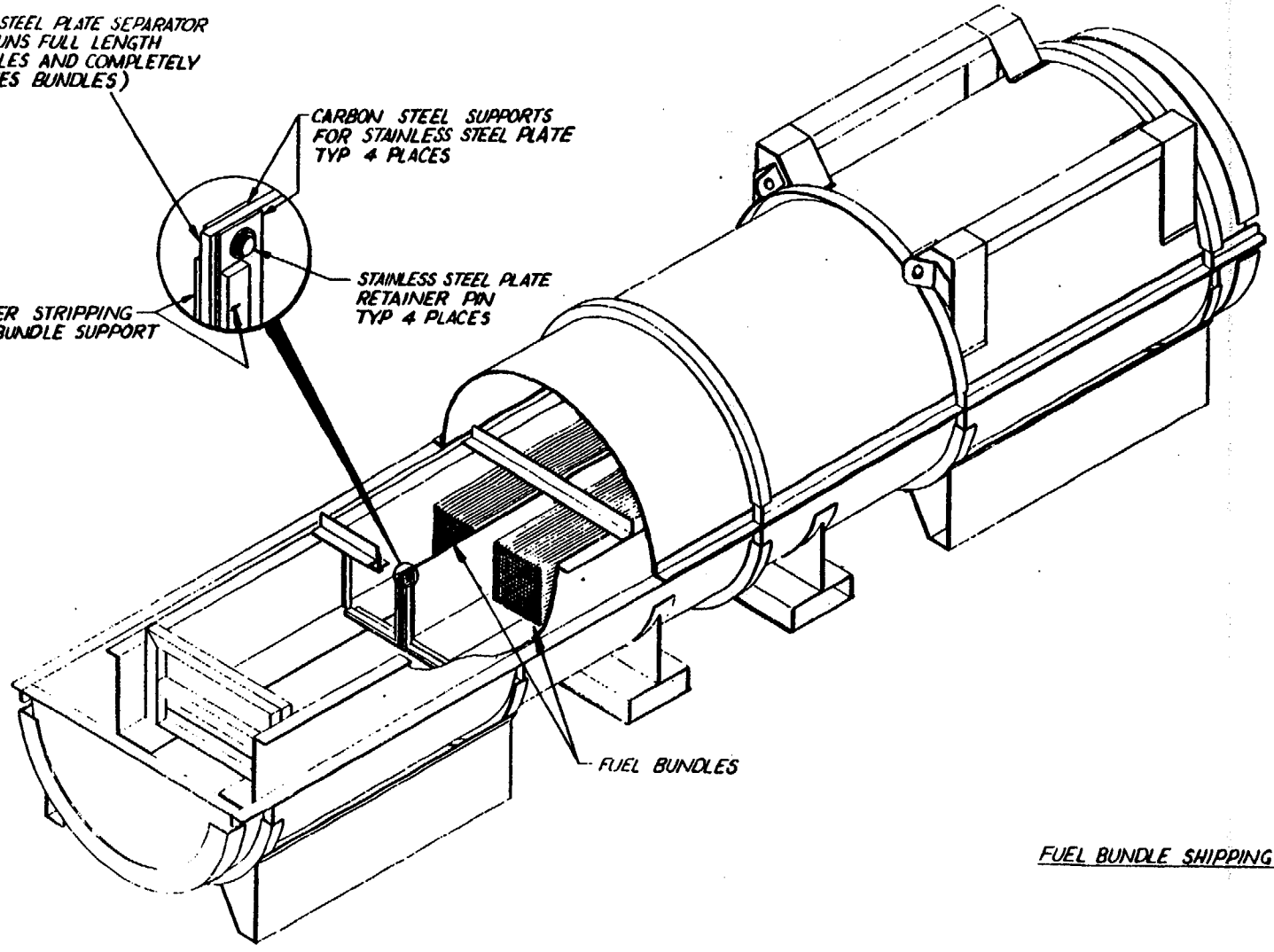
(6) The internal and external structures supporting or protecting the containment shell or vessel for the two (2) fuel bundles are shown in the referenced drawings, as are the internal structures for supporting the fuel bundles within the shipping container. The external shell is supported by "L" shaped flanges, 1/4 in. thick, welded transversely to each half of the shell.

(7) The pressure release valves and lifting devices are also shown in the referenced drawings. There are no sampling ports.

B. Contents of the Package

Each shipping container shall house two Palisades fuel bundles. The most reactive of these bundles has zoned enrichments of 3.2 and 2.5 w/o U^{235}. Each fuel bundle shall be encased in a plastic bag.

PERSPECTIVE OF FUEL BUNDLE SHIPPING CONTAINER



FUEL BUNDLE SHIPPING CONTAINER

COMBUSTION ENGINEERING, INC. WINDSOR, CONNECTICUT

Figure 1

24-P-3345

FIGURE WITHHELD UNDER 10 CFR 2.390

FIGURE WITHHELD UNDER 10 CFR 2.390

FIGURE WITHHELD UNDER 10 CFR 2.390

FIGURE WITHHELD UNDER 10 CFR 2.390

FIGURE WITHHELD UNDER 10 CFR 2.390

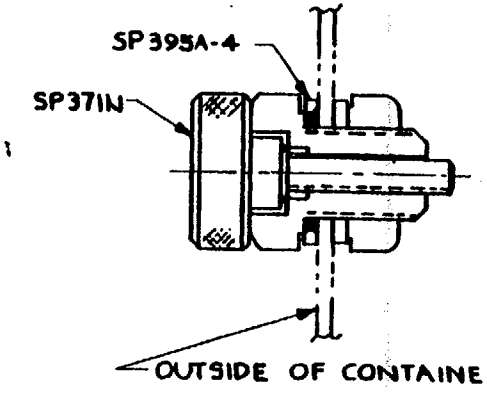
FIGURE WITHHELD UNDER 10 CFR 2.390

FIGURE WITHHELD UNDER 10 CFR 2.390

FIGURE WITHHELD UNDER 10 CFR 2.390

FIGURE WITHHELD UNDER 10 CFR 2.390

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVED



QTY REQ'D	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	CODE IDENT	MATERIAL OR NOTE	SPECIFICATION	DWG SIZE
1	SP395A-4	WASHER - SEAL				B
1	SP371N	VALVE-RELIEF				B

LIST OF MATERIALS OR PARTS LIST

SPECIFICATION CONTROL DRAWING

NOTICE: APPLIED DESIGN COMPANY ASSUMES NO LIABILITY FOR THIS DRAWING OR ITS CONTENTS EXCEPT WHEN USED FOR PROCUREMENT PURPOSES THIS DRAWING MAY NOT BE REPRODUCED IN WHOLE OR IN PART, AND NO RIGHT OR LICENSE TO MAKE, USE OR SELL THE SUBJECT MATTER HEREBY IS CONVEYED HEREBY.

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES

TOLERANCES ON

FRACTIONS DECIMALS ANGLES

MATERIAL

	DATE
DRAWN MJK	4-24-66
GEN CHK JH	6-28-66
STRESS	
FUNCTION	
MATERIAL	
APPROVED	
APPROVAL DESIGN ACTIVITY	
APPROVAL OTHER	

APPLIED DESIGN COMPANY, INC
TONAWANDA, NEW YORK

VALVE ASSEMBLY - RELIEF, MANUAL

CODE IDENT NO.	SIZE	
98425	B	SP371P
SCALE 2/1		SHEET

Figure XI

The radioactive constituents are unirradiated uranium dioxide fuel pellets, enriched to a maximum of 3.2.w/o U^{235}. The maximum radioactivity f r each fuel bundle is 0.7 curies. The maximum for each loaded fuel container is 1.4 curies, with the maximum radioactivity for a shipment of eight (8) containers or sixteen (16) fuel bundles being eleven (11) curies.

The maximum amount of uranium dioxide ceramic pellets in each shipping container is 2100 lbs., i.e., 1050 lbs., per fuel bundl

Paragraphs a(3) and a(4) are not applicable.

Paragraph b(6) is not applicable.

71.23 Package Evaluation

(a) The package satisfies the standards specified in the applicable paragraphs in Sub-part C, as discussed below:

71.31 - General Standards for All Packaging

a. There will be no significant chemical, galvanic or other reaction among the packaging components or between the packaging components and the package contents. The shipping container is made of carbon steel and the contents are zircaloy clad fuel bundles wrapped in polyethylene bags.

b. The shipping container is equipped with a positive closure which will prevent inadvertent opening.

c. Lifting Devices:

(1) There are four (4) lifting eyes on the lid, all of which are used to lift the loaded container. Each of the lifting eyes is capable of lifting the loaded package. This was shown by lifting the loaded container free of the floor by each of its lifting eyes and holding to illustrate no yielding in the lifting eye.

(2) It is not necessary to demonstrate that the lifting devices be capable of supporting three (3) times the weight of the loaded package without generating stress in any material of the container in excess of its yield strength because no more than one (1) loaded package will be lifted at one time. This is assured because this package will be part of a Fissile Class III shipment. As such, the containers shall be transported in a vehicle for the sole use of Combustion Engineering, with a specific restriction for sole use to be provided in the special arrangements. The special arrangements shall also include procedures for unloading the shipping containers one at a time. This will provide adequate administrative control to assure that lifting devices will never have to support more than the weight of one loaded container. The lifting eyes will not have to support any compressive load, because loads placed on top of the shipping container will be supported by the stacking brackets.

d. Tie-Down Devices

(1) There is no system of tie-down devices which is a structural part of the container. The container is secured to the truck bed by a chain that is passed over the container and fastened to the truck bed. In addition, the containers on the truck bed are shored with wooden blocks.

(2) Since this package will be part of a Fissile Class II shipment, it will be transported in a vehicle for the sole use of Combustion Engineering, with a specific restriction for sole use to be provided in the special arrangements. Combustion Engineering will supervise the loading of the vehicle to assure that the containers are fastened to the truck as described above. This will provide adequate administrative control to assure that no structural part of the container is used as a tie-down device.

(3) There is no tie-down device which is a structural part of the package.

71.24 Procedural Controls

Prior to each shipment, the container shall be inspected to assure that:

(a) The container has not been significantly damaged.

(b) The neutron absorber plate is in place.

(c) The closure of the package and any sealing gaskets are present and are free from defects.

(d) The internal gauge pressure of the container will not exceed, during the anticipated period of transport, the maximum normal operating pressure.

71.32 Structural Standards for Large Quantity Packaging

This section is not applicable to this application.

71.33 Criticality Standards for Fissile Material Packages

The package is so designed and constructed, and its contents are so limited that it would be sub-critical if it is assumed that water leaks into the containment vessel, and

(1) Water moderation of the contents occurs to the most reactive credible extent consistent with the chemical and physical form of the contents, and

(2) The containment vessel is fully reflected on all sides by water.

Nuclear safety calculations were performed and show a k_{eff} of 0.915 for the above conditions. Physics constants for the various regions of the assembly were obtained from the same codes as were used in previous safety calculations. Please refer to Amendment No. 8, as amended, to the subject License.

71.34 Evaluation of a Single Package

(a) The effect of the transport environment of the safety of any single package was evaluated as follows:

(1) The ability of the container to withstand conditions likely to occur in normal conditions of transport, specified in 71.35, were assessed by subjecting a shippin container to test and by other assessment. (Please see References A and B).

The heat and cold requirements are not applicable. Any pressure rise in the container above 7.5 ± 1 psi gauge wi be released by the pressure release valve.

Materials of all structural components used in the manufacture of the container have physical and mechanical properties equivalent to or better than mild steel throug out a temperature range of -40°F to 1500°F.

Vibration normally incident to transport was experienced by conducting a normal shipping test with a simulated fue bundle inside the container. No damage was incurred.

The water spray test is not applicable because shell and structural material are steel.

The free drop test was performed and no significant damage occurred to the container or its contents.

The penetration test was not performed, because it is not credible that this test can result in the puncture of the shell and the puncture of the zirconium clad fuel rods so as to release radioactive material.

The requirement that the container support in compression five times its loaded weight without yielding is not applicable because it will never be loaded more than two high. The package will be part of a Fissile Class III shipment; therefore, it will be transported in a vehicle for the sole use of Combustion Engineering. Combustion Engineering will supervise the loading of the vehicle to assure that the containers are loaded only two high.

Therefore, in view of the above, it is concluded that under the normal conditions as defined in Appendix A, i.e.,

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

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

71.37 Evaluation of an Array of Packages of Fissile Material

(a) The effect of the transport environment on the nuclear safety of an array of packages was evaluated by assuming:

(1) That two (2) damaged shipping containers became abutted top-to-top under water, thus involving four (4) fuel assemblies in close proximity. It was further assumed that separation between pairs of assemblies would be provided only by the collapsed steel walls and the top restraining structure of the strongbacks of the two (2) shipping containers. It was postulated that this separation between pairs of bundles could never be less than 12 inches, because in the undamaged condition the separation is more than twice that, and the 30 foot drop tests have shown that the containment shell does not collapse, the bundles remain in the same relative position with respect to the top of the container, and the poison plate remains intact between the two (2) bundles in each container. Any other alignment of the shipping containers, or abutment, other than top-to-top should result in a less reactive situation, because of the steel structure within the lower sections of the shipping container and the runners that provide a base for each container. Nuclear safety calculations were performed and showed k_{eff} to be 0.914.

(2) That two (2) damaged shipping containers become abutted side-to-side under water, and the strongbacks shifted sideways so that the outermost bundles are 6 inches apart and separated by the two (2) steel shells, (each is 1/8 inch thick), and the two (2) steel strongback edges (each is 1/4 inch thick). Nuclear safety calculations were performed and shown k_{eff} to be 0.92.

The nuclear safety calculations for the accident condition are presented in Reference C.

(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 Part 71 of USAEC Title 10:

(1) The package will be sub-critical. The nuclear safety calculations were presented in Amendment No. 8, as amended to the subject License.

(2) The geometric form of the package contents will not be substantially altered.

(3) There will be no substantial reduction in the effectiveness of the packaging, including:

(i) Reduction by more than 5 per cent in the total effective volume of the packaging on which nuclear safety is assessed;

(ii) Reduction by more than 5 per cent in the effective spacing on which nuclear safety is assessed, between the center of the containment vessel and the outer surface of the packaging, or;

(iii) Occurrence of any aperture in the outer surface of the packaging large enough to permit the entry of a 4 in. cube.

(2) The effect on the loaded container of conditions likely to occur in an accident was assessed by subjecting a prototype container containing a simulated fuel bundle and a weighted mockup to two 30 foot free drop tests and puncture tests as specified in Appendix B of USAEC Title 10 Part 71.

These tests demonstrated that the loaded container would be sub-critical (Reference B) and that no radioactive material was released.

The thermal test was not performed because all structural materials in the shipping container, the fuel bundles, and the stainless steel absorber plate can withstand 1475°F for thirty (30) minutes.

The water immersion test was not performed because full flooding was assumed in the nuclear safety calculations.

It was evident from the test that the package would be sub-critical, (as required in paragraph 71.36(b), because the two (2) fuel bundles remained in the same position with respect to each other, the simulated fuel bundle was relatively undamaged, and the poison plate remained intact between the bundles. Therefore, the nuclear safety calculations used for the undamaged package apply, since water moderation and reflection on all sides by water were assumed in that calculation.

71.40 Specific Stardards for a Fissile Class III Shipment

This container shall be used as a Fissile Class III Shipment and meets the criteria of 71.40(a). Nuclear safety analyses performed previously, for Amendment No. 8 as amended to the subject License, showed that the loaded containers are sub-critical when stored three (3) high in an array that is infinitely long and infinitely wide. This assures that the undamaged shipment of two high, two wide and two long would be sub-critical with an identical shipment in contact with it, and the two shipments closely reflected on all sides by water.

The analysis presented as part of the requirements of paragraph 71.37 shows that the shipment would be sub-critical if subjected to the hypothetical accident conditions specified in 71.40(b).