

DOCKET NUMBER 71-9160



GULF NUCLEAR, INC.

PACKAGE EVALUATION

MODEL 20-VS

MODEL 40-VS

TYPE B QUANTITIES



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APPENDIX

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1 GENERAL INFORMATION

The enclosed information concerns a metal container which weighs forty-two (42) pounds and contains thirty-four (34) pounds of depleted uranium. The container is a radiography device used to perform field operations and is used to transport Iridium-192 sealed sources.

1.1 INTRODUCTION

The containers, Gulf Nuclear, Inc. models 20-VS and 40-VS will be used to transport 100.0 curie and 200.0 curie Iridium-192 sealed sources. The container is approximately six (6) inches wide, eight (8) inches long and twelve (12) inches high. The upper portion includes a handle for carrying purposes. The outer case and all external parts of the container are fabricated from stainless steel. The two containers, 20-VS and 40-VS, are identical in construction. The two model numbers reflect a slight difference in the internal shield.

2 PACKAGE DESCRIPTION

2.1 Packaging

The package contains a depleted uranium shield which is designed to shield a 100 or a 200 curie Iridium-192 sealed source. The sources, Gulf Nuclear, Inc. Model RG-13 and RGSA-13, meet special form requirements (See Appendix 6). The shield is contained in a stainless steel case. The void between the shield and the case is filled with epoxy (See Appendix 1).

2.2 Contents of Package

The container is used to transport quantities up to 200 curies of Iridium-192. The radioactive material is contained in a sealed source configuration that meets special form requirements (See Appendix 6).

3 STRUCTURAL EVALUATION

3.1 Discussion

The outer shell of the container is constructed of stainless steel which is 0.076 inches thick. With the exception of the top lid, all seams are welded. The lock block, nose piece, etc., are either stainless steel or plated steel. The epoxy filler adds strength to the assembly as well as being a fire shield for the depleted uranium.

3.2 Design Criteria

The package is designed to function as a radiography device as well as a transport container. Radiation consideration are such that the package has a radiation level of less than 200 mR/hr on the surface and less than 50 mR/hr at six inches. The package is also designed to meet Yellow III Label criteria.

3.3 Weight

The weight of the package is forty-two (42) pounds.

3.4 Mechanical Properties of Materials

All metal parts are fabricated from steel with the exception of the shielding material which is depleted uranium. The internal space between the shield and the housing is filled with epoxy. Four vent holes are provided in the top of the housing.

3.5 Chemical and Galvanic Reactions

The radioactive materials are contained in a capsule constructed from 17-4 PH stainless steel and meets special form requirements. There is no chemical or galvanic reactions between depleted uranium, epoxy and steel.

3.6 Positive Closure

The radioactive source is held in place with a lock, a safety plug in front of the source, which is a snaptite fitting, and a dust cover in the lock block that fixes the back of the source.

3.7 Lifting Devices

There is a handle on the top of the container that is designed for lifting. This handle meets the specifications as required in 10 CFR 71.31(C)(1); i.e. it can support more than three (3) times the weight of the package without generating stress in any materials (See photograph number 3.7). The handle is so designed that failure of this part under an excessive load would not impair the containment nor shielding properties of the package. [10 CFR 71.31(C)(4)]

3.8 Tie-Down Devices

There is no part of the package designed primarily as a tie-down device. The carrying handle described in 3.7 could be used as a tie-down device if needed. This handle will meet the specifications as required by 10 CFR 71.31(d)(3).

3.9 Load Resistance

The container, regarded as a simple beam, supported at its ends along the major horizontal axis is capable of supporting five (5) times its weight without generating stress in any materials of the packaging in excess of its yield strength. [10 CFR 71.32(a)] (See Photograph number 3.9)

4.0 Standards of Appendix A Normal Conditions of Transport

The package met all the standards of Appendix A, heat, cold, pressure, vibration, water spray and free drop tests with no compromise to the structural design or the shielding properties.

4 HYPOTHETICAL ACCIDENT CONDITIONS

Part 71 Appendix B

4.1 Free Drop

The package was dropped a total of three (3) times from a height of thirty (30)

feet onto a one-half ($\frac{1}{2}$) inch steel plate positioned on an eight (8) inch thick concrete pad. Physical damage occurred, but shielding and container characteristics were not affected. Two controlled drops were made using a jerk line to cause the container to strike the plate on the lock box. Damage was done to the lock box, but the box remained bolted to the camera and was functional. (See photographs number 4.1-2, 4.1-3, 4.1-5, 4.1-6)

4.2 Puncture

The package was dropped two (2) times onto a six (6) inch diameter bar eight (8) inches long. The first drop, the package struck on a corner with no appreciable damage. The package was dropped two (2) more times causing it to land on the lock box. There was no damage evident. (See photographs number 4.2-1, 4.2-2, 4.2-3)

4.3 Thermal

The package was suspended over a six (6) foot diameter tank with diesel fuel floating on top of water. The diesel fuel was ignited and a fire maintained for a thirty (30) minute interval. The temperature was monitored by use of a potentiometer to insure a temperature of at least fourteen hundred seventy-five (1475) degrees Fahrenheit was maintained. Diesel fuel burns at approximately twenty-eight hundred (2800) degrees Fahrenheit. After the thirty (30) minute test, the pumping of the fuel was stopped and the fire allowed to extinguish itself, and the package to cool naturally.

Results

There was no visible damage to the package. Flammable gases were emitted through the vent holes in the top of the camera during the burn test and for three (3) minutes after the fire was extinguished. There was no apparent damage to the package. Removing the top of the package, it was observed that part of the epoxy was burned and charred, but the shielding was still in place. This demonstrates that the shielding has not changed position throughout the testing of the of the package. (See photograph number 4.3-5)

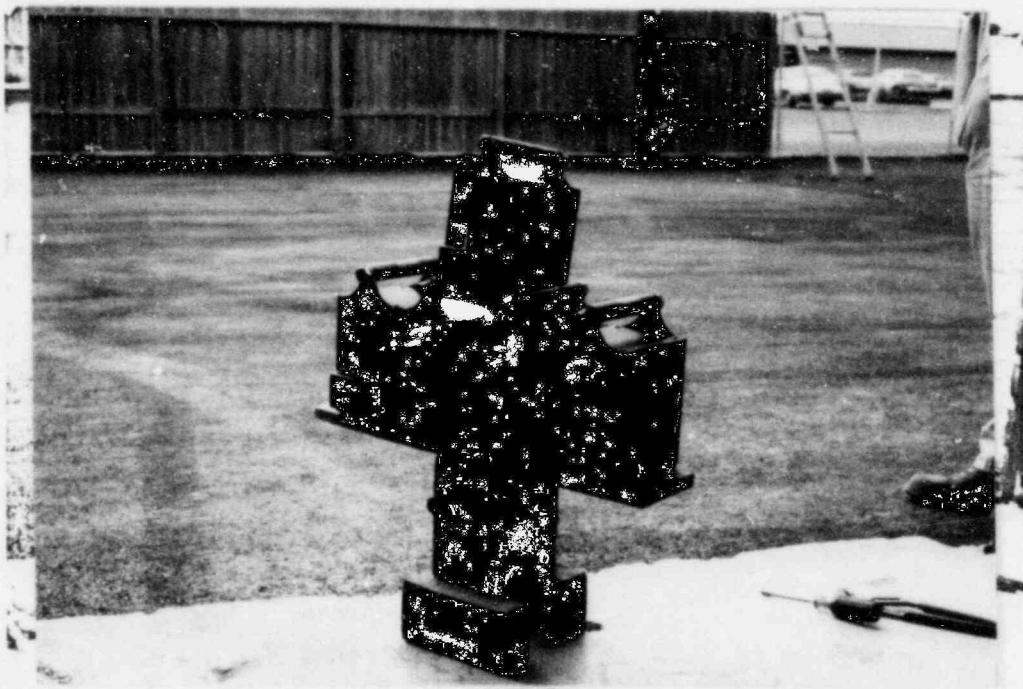
The radiation profile measured after the test is presented in Appendix 5.

APPENDIX 1(a)

STRUCTURAL EVALUATION



3.7-1 Device supporting three times the weight of package



3.9-1 Device supporting five times its weight

APPENDIX 2

FREE DROP TEST



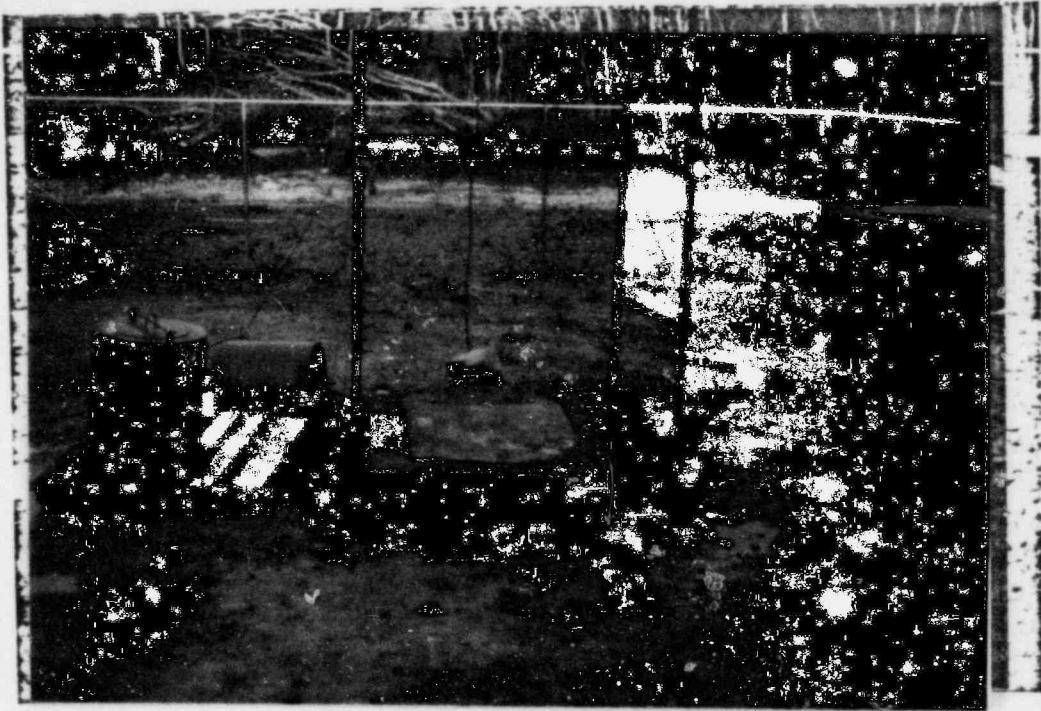
Device before the test



Device being prepared for drop

APPENDIX 2 (Con't)

FREE DROP TEST



4.1-2 Device striking pad



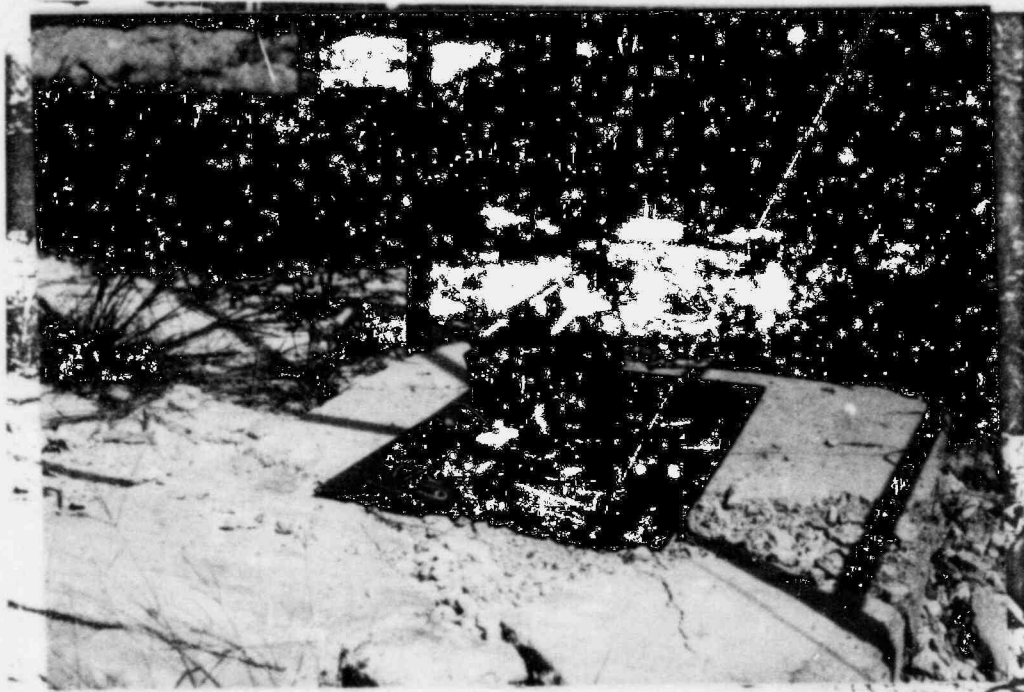
4.1-3 Device after striking pad

APPENDIX 2 (Con't)

FREE DROP TEST



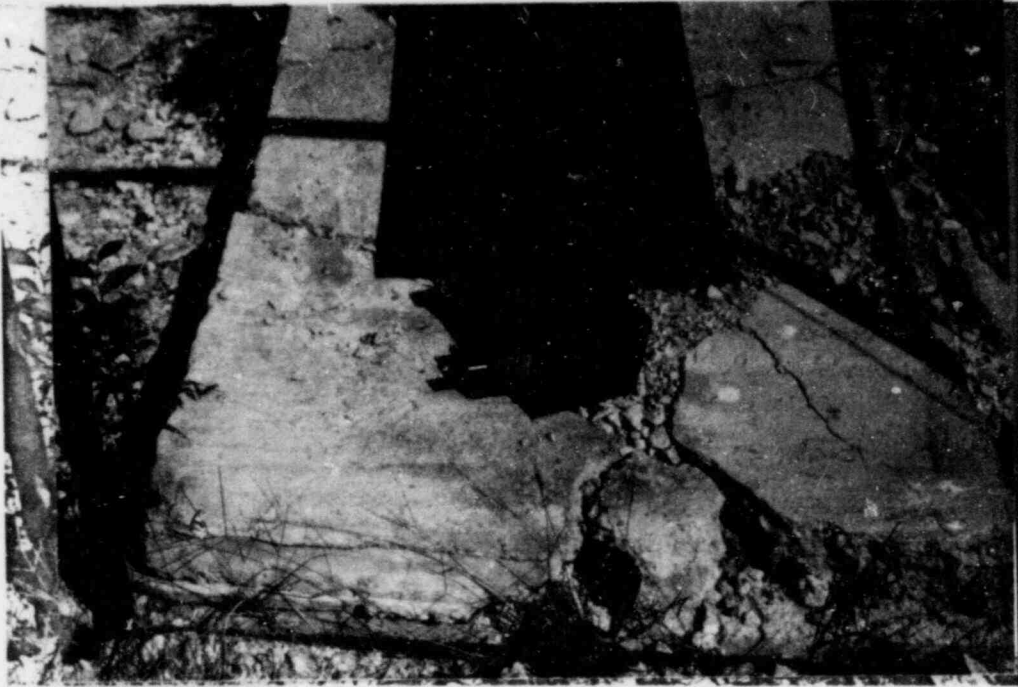
4.1-4 Device after striking pad



4.1-5

APPENDIX 2 (Con't)

FREE DROP TEST

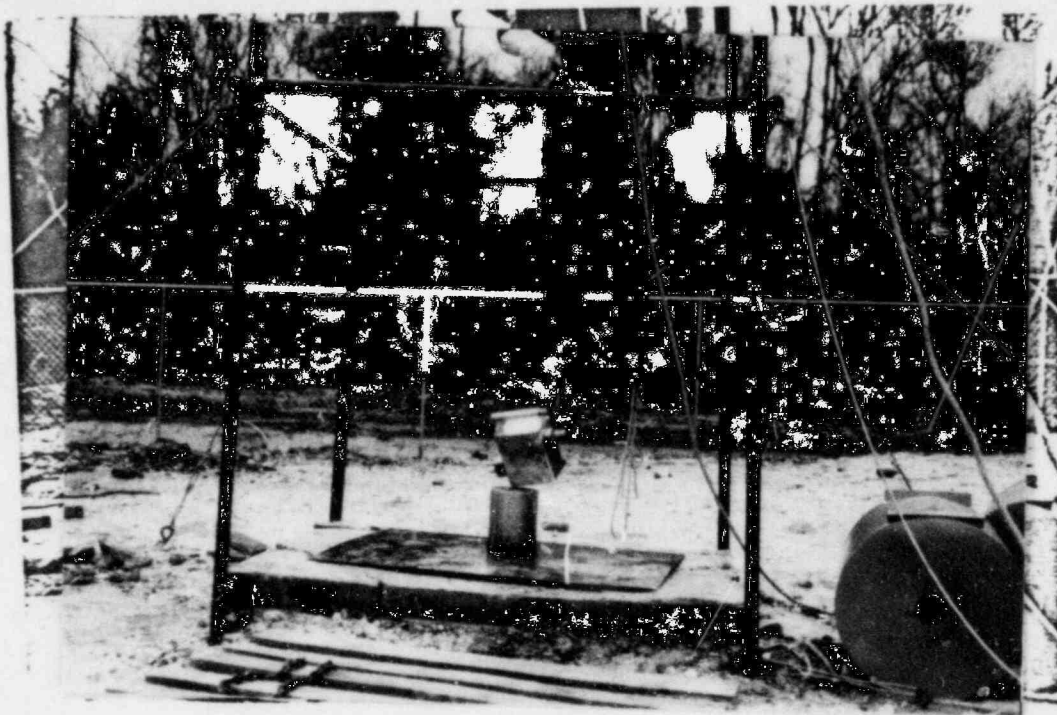


4.1-6

(7)(a)

APPENDIX 3

PUNCTURE TEST



4.2-1 Device striking pin



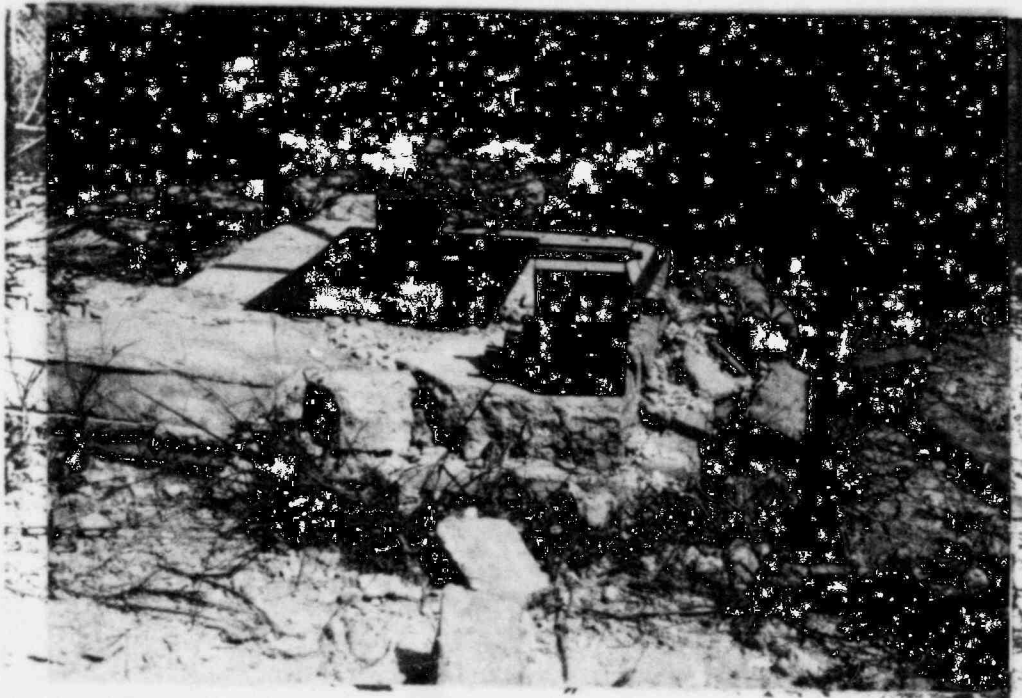
4.2-2 Device after striking pin

APPENDIX 3 (Con't)

PUNCTURE TEST



4.2-3



4.2-4

APPENDIX 4
THERMAL TEST



4.3-1 Device before test



4.3-2 Device during test

APPENDIX 4 (Con't)

THERMAL TEST



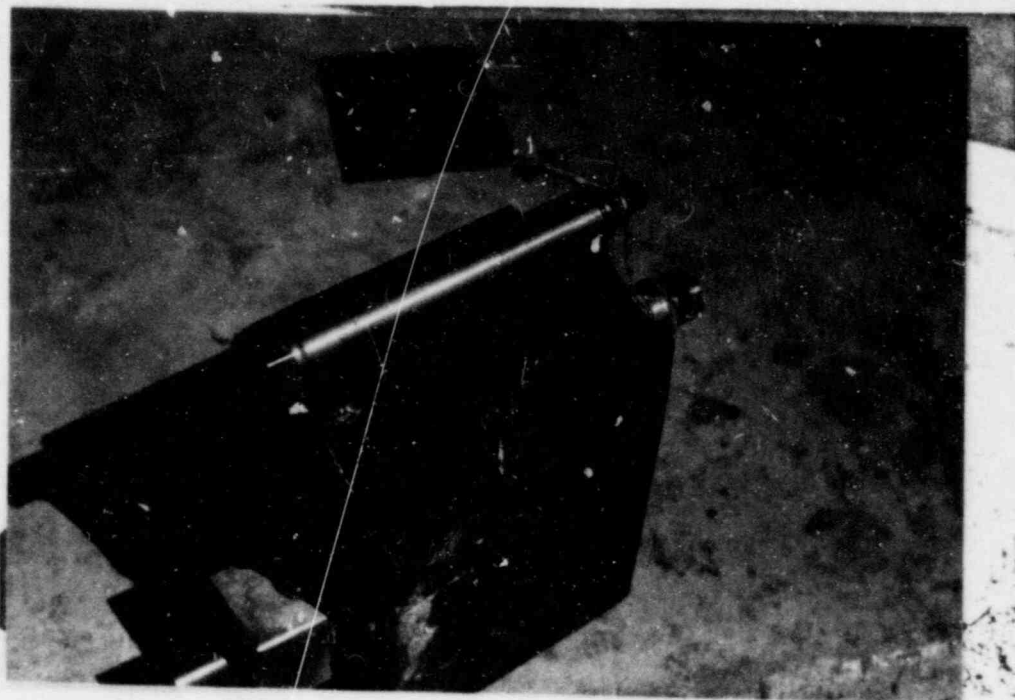
4.3-3 Device immediately after test



4.3-4 Device three minutes after test

APPENDIX 4 (Con't)

THERMAL TEST



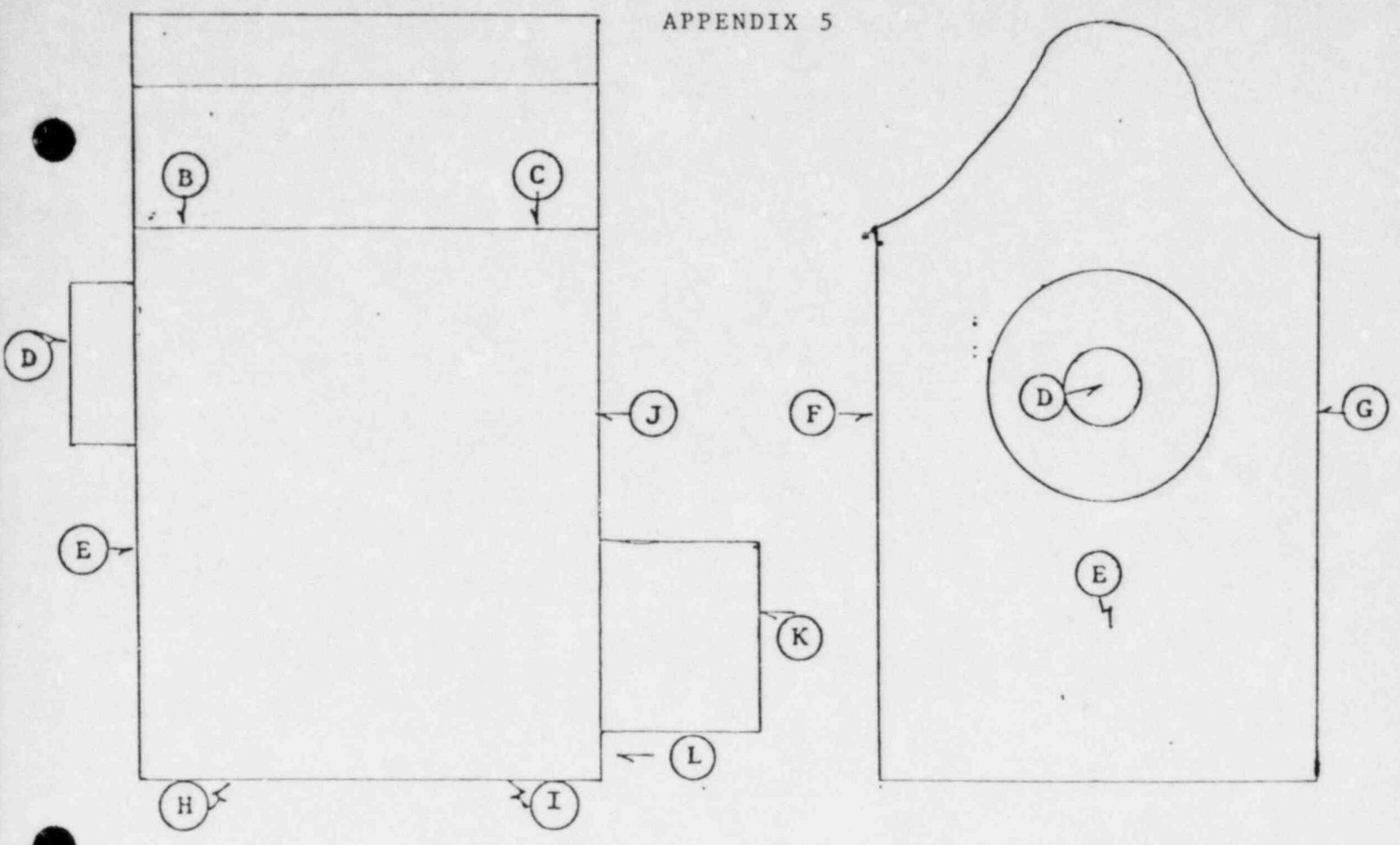
4.3-5

(10)(a)

All readings taken at 6" from surface.

(A)

APPENDIX 5



Serial Number _____ Date 1/6/82

Model Number 20VS Signature _____
(Prototype Stainless Steel)

Pos.	Reading	Notes
A		105 curies, Iridium-192 source in the survey
B		Eberline E-120G, S/N-5629, calibration date 11/17/81
C		Highest surface reading 200 mR/hr at position G
D		
E		
F		
G		
H		
I		
J		
K		
L		

IAEA CERTIFICATE OF COMPETENT AUTHORITY

Special Form Radioactive Material Encapsulation

Certificate Number USA/0121/S

(Revision 1)

This certifies that the encapsulated sources, as described, when loaded with the authorized radioactive contents, have been demonstrated to meet the regulatory requirements for special form radioactive material as prescribed in IAEA 1/ and USA 2/ regulations for the transport of radioactive materials.

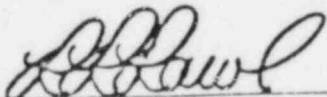
I. Source Description - The sources described by this certificate are identified as Gulf Nuclear Inc., Models RA-17; RB-1, -2, -3, -4, -5, -6; RC-16; RG-13; RGS-A-13; RS-12; RR-7, -9, -10, -11; RS-10; RT-14, -15; RPL-4C, -1G, -2NA, -5, -3T; and RAG-17, which are encapsulated in stainless steel and measure 0.240" in diameter and 0.400" in length.

II. Radioactive Contents - The authorized radioactive contents of these sources consist of not more than 200 Curies of Iridium-192 as metal pellets.

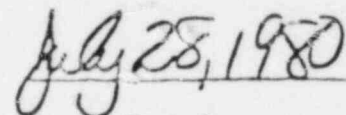
III. This certificate, unless renewed, expires May 31, 1983.

This certificate is issued in accordance with Marginal C-6.1 of the IAEA Regulations 1/, and in response to the May 6, 1980 petition by Gulf Nuclear, Inc., Houston, Texas and in consideration of the associated information therein.

Certified by:



Richard R. Rawl
Chief, Radioactive Materials Branch
Office of Hazardous Materials Regulation
Materials Transportation Bureau



(Date)

1/ "Safety Series No. 6, Regulations for the Safe Transport of Radioactive Materials, 1967 Edition", published by the International Atomic Energy (IAEA) Vienna, Austria.

2/ Title 49, Code of Federal Regulations, Part 170-178, USA.

Revision 1 issued to extend expiration date.

APPENDIX 7

The hypothetical accidents, free drop test, puncture test and thermal test, were witnessed by the following individuals.

C.P. Hopcraft

C.P. Hopcraft, Vice-President,
Production

Elick H. Acree

Elick H. Acree, Vice-President
Research and Development