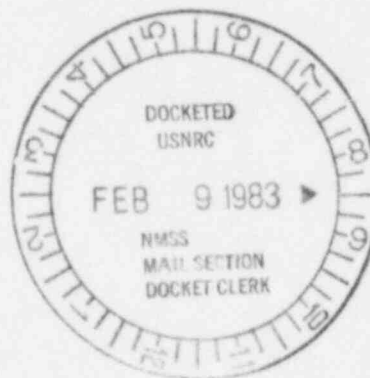


DOCKET NUMBER 71-9161



GULF NUCLEAR, INC.
PACKAGE EVALUATION
MODEL R
TYPE B QUANTITIES



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1 GENERAL INFORMATION

The enclosed information concerns a metal container which is an overpack that is used to transport Gulf Nuclear, Inc. Model 20-V, 40-V, 20-VS and 40-VS radiography devices and radiography source exchangers, Models U-110, U-110A, U-110B and U-110C. All of these devices are transported in the container Model R. The devices may contain up to 200 curies of Iridium-192.

1.1 INTRODUCTION

The container, Model R, will be used to transport up to 200 curies of Iridium-192. The radioactive material is contained in stainless steel capsules which meet special form requirements.

2 PACKAGE DESCRIPTION

2.1 Packaging

The outer container is a ten gallon drum, constructed of twenty gauge steel, an open head with bolt locking ring. There is a layer of urethane foam inside the drum that varies in thickness from $\frac{1}{2}$ inch to $2\frac{1}{2}$ inches. The foam serves two purpose; (1) a fireshield and (2) protects the inner container during transit.

2.2 Contents of Package

The inner containers have the following characteristics:

- (1) 20-V: A radiography device which has an outer aluminum case and a depleted uranium shield. The space between the uranium and case is filled with epoxy.
- (2) 40-V: Same construction as the 20-V with a slightly different uranium shield.
- (3) 20-VS: A radiography device which has an outer stainless steel case and a depleted uranium shield. The space between the uranium and case is filled with epoxy.
- (4) 40-VS: Same construction as the 20-VS with a slightly different uranium shield.
- (5) U-110: A device used to transport and exchange radiography sources in the field. An aluminum case similar to the 20-V, a depleted uranium shield. The inside space filled with epoxy.
- (6) U-110A, B and C: Same as the U-110 with slight difference in the locking mechanisms to accomodate radiography sources of different lengths.

3 STRUCTURAL EVALUATION

3.1 Discussion

The Model R package is a metal drum partially filled with urethane foam which adds strength and thermal protection. The inner containers house the radiation shielding material and their function is to protect the depleted uranium and to hold the radioactive source in the proper position within the shield.

3.2 Design Criteria

The outer package primary function is to aid in protecting the inner package. The drum prevents anyone from tampering with the inner devices. The inner devices have multi-use capabilities and serve at least two functions, transporting and source handling. Primary containment of the radioactive materials is provided by the sealed source itself. The radiation shielding is provided by the depleted uranium shield. The outer case of the inner container and the outer container (drum) protects the shield from inadvertent damage.

3.3 Weight

The weight of the package is fifty-five pounds.

3.4 Mechanical Properties of Materials

The drum is constructed of twenty gauge steel. The 20-V, 40-V and the U-110 series are devices with aluminum housing and uranium shields. The 20-VS and the 40-VS are stainless steel devices. The packaging material is poured in place urethane foam.

3.5 Chemical and Galvanic Reactions

There are no chemical or galvanic reactions with the materials of construction.

3.6 Positive Closure

The drum is equipped with a ring and bolt closure. The ring is also fixed with a lead seal.

3.7 Lifting Devices

There are no lifting devices on the package.

3.8 Load Resistance

The construction of the drum is such that when supported at both ends the drum withstood a load of three hundred fifty pounds (See exhibit page no.9)[10 CFR 71.32(a)]

3.9 Standards for the Normal Conditions of Transport for a Single Package

Standards for the normal conditions of transport for a single package are met through the design of the container. The container was subjected to the condi-

tions as outlined in Appendix A and parts of Appendix B. The construction of the container being made of twenty gauge steel, passed the criteria of Appendix A, parts 1 through 5. For a free drop, the package was dropped thirty (30) feet (see Photograph number 4.1); for the corner drop, it was dropped four (4) feet; for penetration (see photograph number 4.2) and compression, it supported more than five (5) times its weight (see photograph number 4.4). It was also subjected to a thermal test (see photograph 4.3). Throughout all tests, the lid did not separate from the body indicating that the closure integrity (locking ring) is of a positive nature. There was minor bolt damage, but the nut could be removed from the bolt with the use of proper tools. In all the tests, a radiographic device was inside the container. This radiographic device (a 20-VS camera) has passed the tests for Type B containers. Therefore we feel the Model R package being used as a transport vehicle for the radiographic device meets the necessary requirements for this use as specified in Title 10, Parts 71.

4.1 Free Drop

The Gulf Nuclear, Inc. container, Model R, with a 20-V as the inside device was dropped thirty feet onto a $\frac{1}{4}$ inch thick steel plate placed on an eight inch thick concrete pad. The container maintained some physical damage; however, shielding and containment were not compromised (see Appendix 2, photograph No.4.1).

4.2 Puncture

The container was dropped forty inches, striking a six inch diameter bar, eight inches long. Only minor damage occurred (See Appendix 3, Photograph No. 4.2).

4.3 Thermal

The Model R container was suspended over a six foot diameter tank containing diesel fuel. The fuel was ignited and the fire maintained for thirty minutes. Temperature was monitored to insure that a 1475 degree Fahrenheit point was reached.

Results

The container was deformed and flammable gases were emitted from the container. These gases ceased to burn when the fire was extinguished. The 20-V remained intact with no visible damage (See Appendix 4, photograph No. 4.3).

APPENDIX 1

LOCK RING

20 GA.

20-V
40-V
20-VS
40-VS
UI10-SERIES

URATHANE FOAM

3"

10"

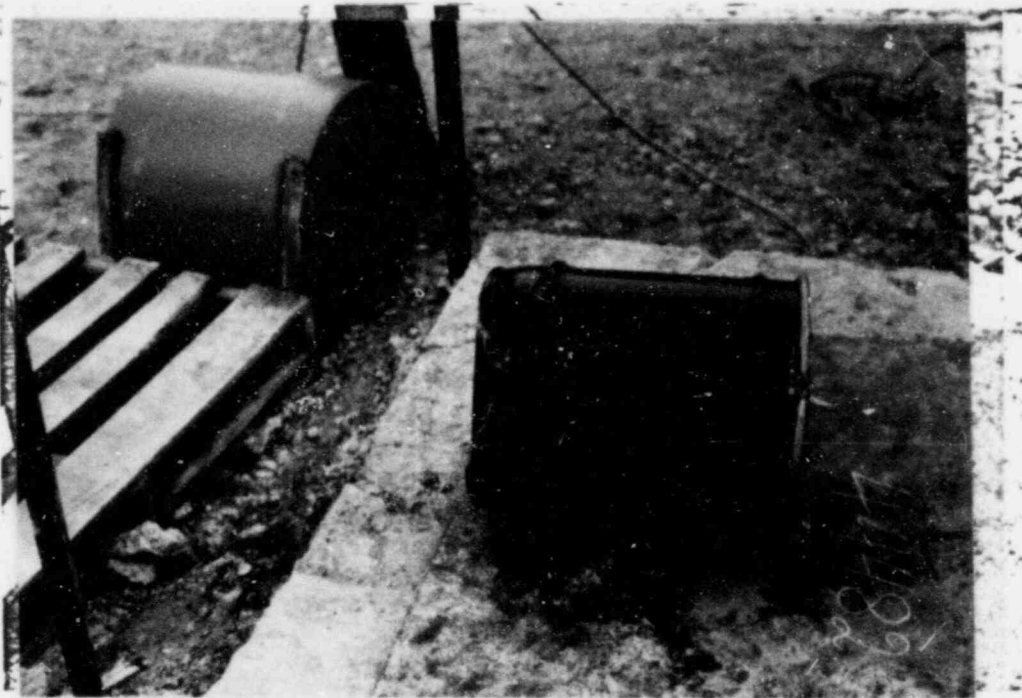
3"

REVISIONS			GULF NUCLEAR, INC.		
NO.	DATE	BY	MODEL R OVERPACK		
1					
2					
3			DRAWN BY MPA	SCALE 1/2	MATERIAL
4			CHK'D	DATE 2-5-82	DRAWING NO.
5			TRACED	APP'D	C-2

APPENDIX 2
FREE DROP TEST



Model R container ready to drop



4.1 Model R container after drop

APPENDIX 3
PUNCTURE TEST

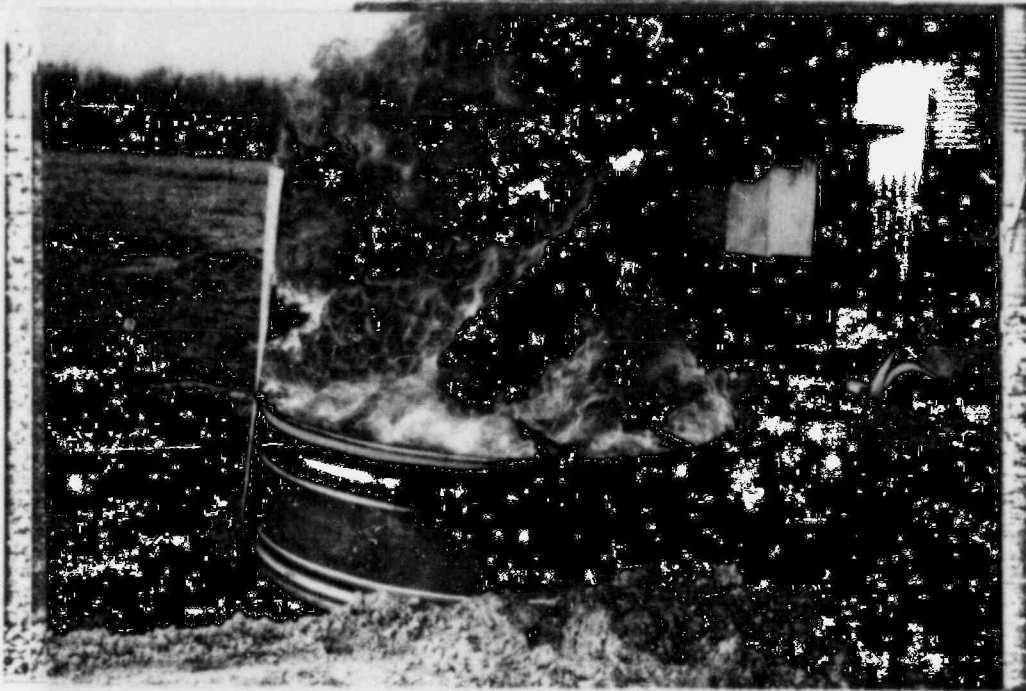


Model R container ready for puncture test



Model R container just before striking pin

APPENDIX 4
THERMAL TEST



Model R container during fire test



4.3 Model R container after fire test (Note charred foam)

APPENDIX 3 (Con't)

PUNCTURE TEST



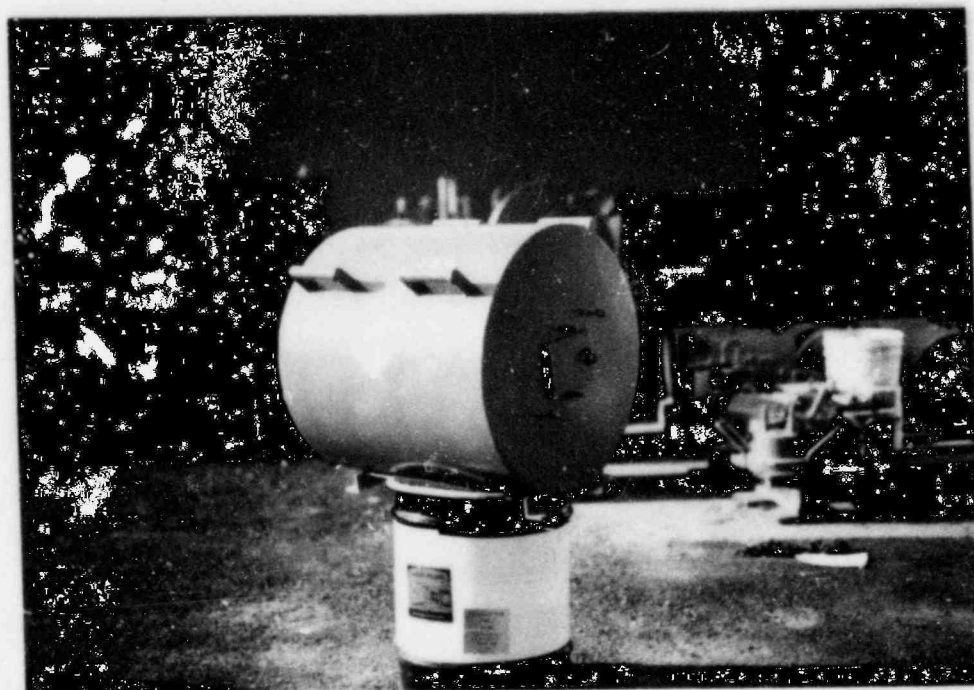
4.2 Model R container after striking pin

APPENDIX 4 (Con't)

THERMAL TEST



Model R container after fire test - Note that 20V exposure device is undamaged.



MANUFACTURER & DISTRIBUTOR:

Gulf Nuclear, Inc.
P. O. Box 58866,
Houston, Texas 77058

MODEL:

20 V

ISOTOPE:

Iridium 192 (Nominal 100 curies)

USE:Panoramic radiographic
exposure deviceDESCRIPTION:

This device consists of a 30 pound depleted uranium shield mounted in epoxy around a sircalloy "S" tube and enclosed in a rectangular aluminum case with overall dimensions of about 6" x 5" x 10". The device is a crank out type of device which drives the source to and from the shielded position. The drive cable connector, exposure tube connector, and the crank assembly are made of stainless steel. The exposure tube is plastic with brass fittings and is 22 feet long.

The camera uses the manufacturer's Model RG-13 or RGSA-13 source and is compatible with either the NEEI RC-6C or NEEI U-110 source changer. If the RGSA-13 source is used, a longer dust cover is provided to cover the disconnect than is provided with the RG-13 source.

LABELING:

The device bears the manufacturer's name, model, number, serial number, radiation symbol, isotope, number of curies, date, "CAUTION RADIOACTIVE MATERIAL", and specifies the device contains 30 pounds of uranium. Source data is contained on a removable label which is provided with each new source.

RADIATION LEVELS:

The highest radiation level about the device at a distance of six inches from the surface was measured to be 32 millirem per hour for a 100 curie source.

SERVICING & INSTRUCTIONS:

The manufacturer provides an instruction manual of operation for the device and states that all repairs of the device are to be performed by the manufacturer.

Texas Department of Health

January 1979

O F F I C I A L U S E O N L Y

This replaces sheet dated September 1974

OFFICIAL USE ONLYDEVICE

MANUFACTURER & DISTRIBUTOR:
 Gulf Nuclear, Inc. (formerly Nuclear
 Environmental Engineering, Inc.)
 P. O. Box 58866
 Houston, Texas 77058

MODEL:
 40V

ISOTOPE:
 Iridium 192 (up to 200 Ci)

USE:
 Industrial radiography
 exposure device

DESCRIPTION:

This exposure device is identical to the manufacturer's Model 20V exposure device, but it has additional internal uranium shielding totaling 34 pounds. The overall dimensions are about 6" x 5" 10" and the shape is rectangular. It has a Teleflex drive cable 35 feet in length with a source tube of 14 feet. The total weight is 45 pounds.

The source used is the same as for Model 20V device, i.e. the manufacturer's Model RG-13 source. Also, the manufacturer's U-110 Source Changer may be used for source exchange.

LABELING:

The device bears labels with the manufacturer's name, model number, serial number, radiation symbol, isotope, number of curies, date, "CAUTION RADIOACTIVE MATERIAL", and specifies 34 pounds of depleted uranium is contained therein.

RADIATION LEVELS:

The maximum radiation level six inches from the surface of the device when fully loaded is 35 mR/hr and at three feet is less than 2 mR/hr.

INSTRUCTIONS:

The manufacturer provides an instruction manual and advises that collimators should be used to reduce personnel exposures. The manual also advises that all repairs of the device should be performed by the manufacturer.

Texas Department of Health Resources

OFFICIAL USE ONLY

March 1977

O F F I C I A L U S E O N L YDEVICEMANUFACTURER & DISTRIBUTOR:MODEL:

Nuclear Environmental Engineering, Inc.
Webster, Texas

U-110

ISOTOPE:USE:

Iridium 192 (Nominal 100 curies)

Industrial Radiography
Source Changer.

DESCRIPTION:

This source changer is designed for use only with the Nuclear Environmental Engineering, Inc. Models RG-13, RT-14, RC-16, RAG-17, and RB-1 sources and the sources for which these sources are replacements. The shielding consists of about 26 pounds of uranium which is contained in a heavy aluminum casing. The exchanger is normally shipped in a DOT-6C shipping drum which has a Radioactive III label. The manufacturer supplies operating instructions.

This sheet replaces sheet dated April 1974.

Texas State Department of Health

O F F I C I A L U S E O N L Y

July 1975

DEVICE

MANUFACTURER & DISTRIBUTOR:

Gulf Nuclear, Inc.
P. O. Box 58866
Houston, Texas 77058

MODEL

U-110A
U-110B
U-110C

ISOTOPE:

Iridium 192
(Up to 200 Ci nominal)

USE

Industrial Radiography
Source Changer

DESCRIPTION:

These source changers are all identical except for the length of the lock box. They all consist of an "S" tube in a 26 pound uranium shield which is held in a heavy aluminum casing. The center of the "S" tube has a stop to prevent sources passing through the device. The exchanger is shipped in a DOT-6C shipping drum labeled with a Radioactive III level. The manufacturer supplies operating instructions for source exchange.

The manufacturer's sources as listed below (and the sources they replace) are authorized to be shipped in the device models as shown.

U-110A	RG-13, RGSA-13, RT-14, RC-16, RB-1A
U-110B	RT-15
U-110C	RB-1, RB-4, RS-12

(These models with different types of disconnect are also authorized)

The highest radiation level on the surface of the device with a 100 Curie source is 140 mR/hr. This reduces to about 6 mR/hour at 12 inches from the surface. Hence, when shipped in the DOT-6C drum, the radiation levels for a 200 Curie source are within DOT requirements.

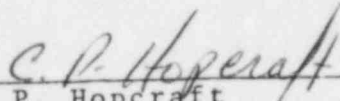
The device is labeled with the conventional symbol, the isotope, activity, date, serial number, and manufacturer's name.

Texas Department of Health Resources


August 1977

APPENDIX 6

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



C.P. Hopcraft
Vice-President-Production



Elick H. Acree
Vice-President-Research and
Development