GUIDE PAGE - REPORT TES-3206

This is the Guide Page to update report TES-3206 to Revision 2, December 1991.

1. Replace "Title Page" with new title page

2. Add "Preface to Revision 2 - pages ix-a and ix-b

3. Replace "Table of Contents" pages x and xi

4. Add Appendix E: "Operating Procedures" and Appendix F: "Acceptance Test and Maintenance Program," pages E-1 thru E-5 and page F1 at end of report (following Appendix D: "Specification for Shield and Shield Vessel Material).

RESUBMITTAL OF PRIOR APPLICATIONS AND SUPPLEMENTS FOR APPROVAL TO TRANSPORT THE SENTINEL (LCG) - 25A RADIOISOTOPE THERMOELECTRIC GENERATOR AS A TYPE B ( ) PACKAGE

TES-3206

AUGUST 1986

REVISION 1

OCTOBER 1986

REVISION 2

DECEMBER 1991

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R2
12/91

PREFACE TO REVISION 2

Revision 2 is in response to a NRC request* to supply additional information to include specific specific sections on operating procedures and maintenance program. The applicability of these two sections is addressed below. Drawing No. 001-70057, Rev. D, also specifically requested is attached to this report. (This drawing was included with Rev. 1 - see Pg. v.)

OPERATING PROCEDURES

The intent of this chapter in the NRC Regulatory Guide 7.9 "Standard Format and Content of Part 71 Applications for Approval of Packaging of Type B, Large Quantity and Fissile Radioactive Material" is apparently to provide procedures for use in the loading and unloading of a typical "package" such as a shipping cask used to transport radioactive materials. A radioisotope fueled thermoelectric generator (RTG), however, is designed to convert the energy given up by the radioisotope's decay directly to electricity and hence, is useful only when loaded.

The Sentinel-25 series packages (RTGs) have been loaded or "fueled" at Oak Ridge National Laboratory (ORNL) and each RTG will remain "fueled" or loaded throughout its useful lifetime. If, and when, at the end of the RTG's useful life, the decision is made to "de-fuel" or unload the RTG, procedures will be developed based on the facilities to be used. Obviously, it is not possible to ship and "empty" package for these same reasons. The procedures for loading, unloading and transport of an empty package as described in the Regulatory Guide, therefore, are not applicable to an RTG. There are,

however, procedures that must be followed to properly handle and transport an RTG and these procedures are outlined in new Appendix E: "Operating Procedures."

ACCEPTANCE TESTS AND MAINTENANCE PROGRAM

Again, the NRC Regulatory Guide, under the heading of "acceptance tests" requests that the applicant discuss those tests to be performed prior to the first use of a package. All of the Sentinel-25 series packages were fabricated and inspected many years ago. Even though tests were performed to assure that the radioisotopic heat sources were leak tight and that the radiation shielding is adequate to meet the requirements of 10 CFR Part 71, no additional units may be built and therefore this section is not applicable. Additionally, an RTG is designed to be maintenance free such that the only maintenance required is related to the shipping pallet and the associated attaching hardware, these items are discussed in new Appenedix F: "Acceptance Test and Maintenance Program."

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* U.S. NRC letter SGTB:MGB 71-4888 dated 04 November 1991 from Charles E. MacDonald to John F. Vogt (TES) with enclosure.

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APPENDIX E

OPERATING PROCEDURES

DECEMBER 1991

The operating procedures discussed in this Appendix pertain to generator handling and transportation requirements.

1. RTG Handling

The SENTINEL 25 Series of RTGs are certified for shipment in vessels, cargo-only aircraft, rail cars and motor vehicles. They may be shipped without any special shipping container, but they must be attached to the steel pallets provided with the generator. The RTG is designed to be handled by fork-lift truck, with the forks fully engaged under the pallet.

An RTG should be handled with reasonable care. The thermoelectric modules are relatively fragile and open or short circuits can develope if the RTG is handled roughly. RTGs should never be dropped or pulled along a surface. Forklift and crane operators should take care to set the units down gently.

2. RTG Preparation for Shipment

To prepare the RTG for shipment the following steps must be taken:

a. Insure that the finned radiator assembly is bolted to the RTG's lid. (It should not normally ever be removed.)

b. Insure that the "shorting plug" furnished with the RTG is installed, when the RTG is disconnected from its electrical load.

c. Insure that the RTG is properly installed on its steel shipping pallet and the attaching hardware shown in Figure E-1 is torqued to 120-130 foot-pounds.

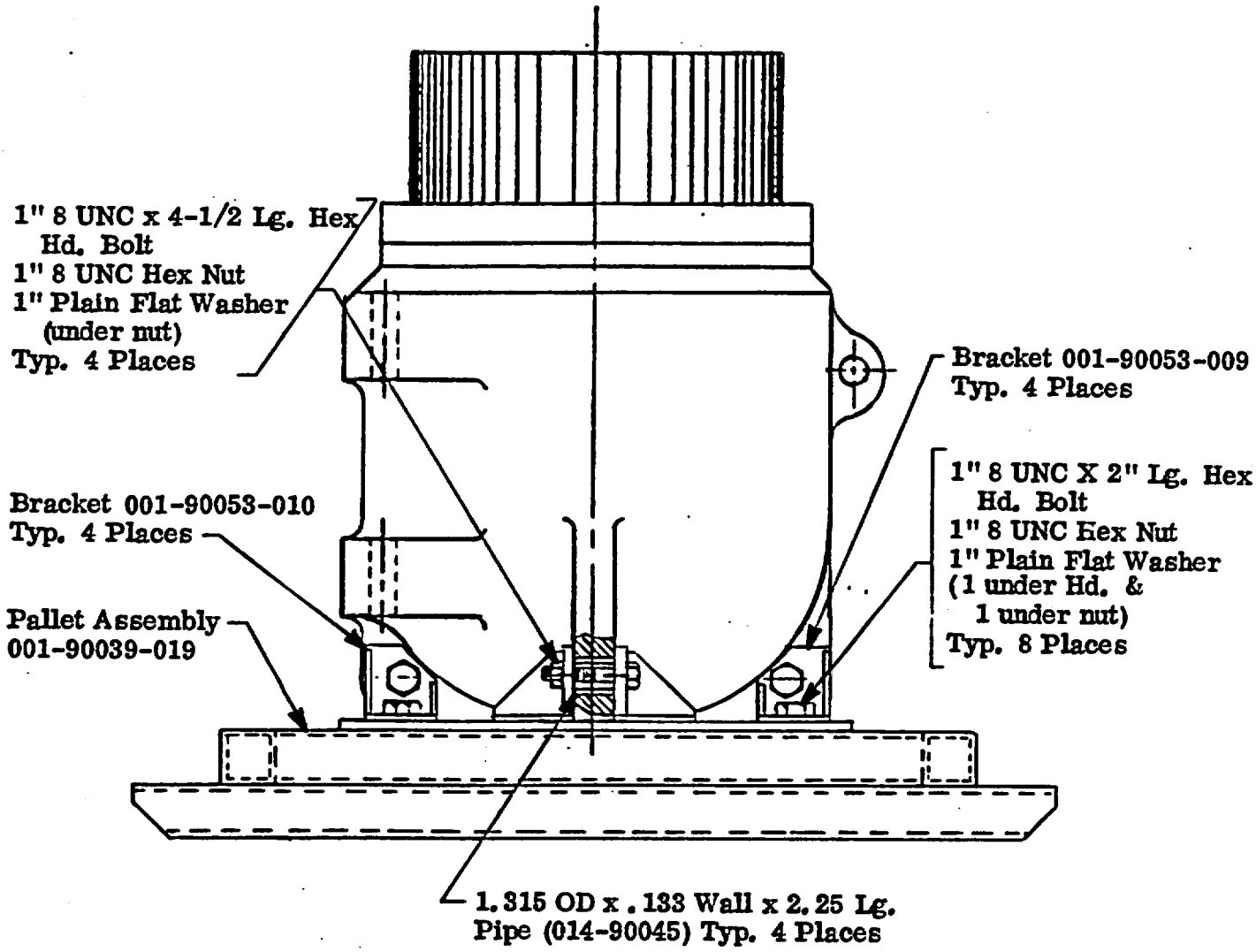

FIGURE E-1. SENTINEL 25A GENERATOR/SHIPPING PALLET MOUNTING HARDWARE

d. Health Physics personnel should verify that the radiation dose rates measured at the RTG surface and at one meter from the surface are in compliance with 10 CFR 71.47.

e. Health Physics personnel should "wipe" test the outer surface of the generator and shipping pallet to assure compliance with 10 CFR 71.87 (i) and license leak test requirements.

f. The RTG's were marked and labelled prior to their initial shipment. Verification should be made to assure that the nomenclature is legible.

Markings

The following markings are required by 49 CFR. Letters must be at least 1/2" high.

(1) "RADIOACTIVE MATERIAL, SPECIAL FORM, N.O.S."

(2) (Gross Weight)

(3) "TYPE B"

(4) "USA/4888/B ( )" for Sentinel 25 Series RTGs

(5) "UN 2974"

(6) (Model Number; e.g.: "SENTINEL 25F")

Labelling

Two "RADIOACTIVE-YELLOW III" labels are required on each RTG. They must be completed to show the radioisotope (strontium-90) curie content (as appropriate), and transport index (as appropriate) and are placed on opposite sides of generator.

The RTG, when loaded for shipment is to be tied down in a configuration similar to that shown in Figure E-2. In addition, the RTG must not be covered and should be kept at least one foot from bulkheads, other cargo and any other obstructions which might restrict the flow if air around the generator.

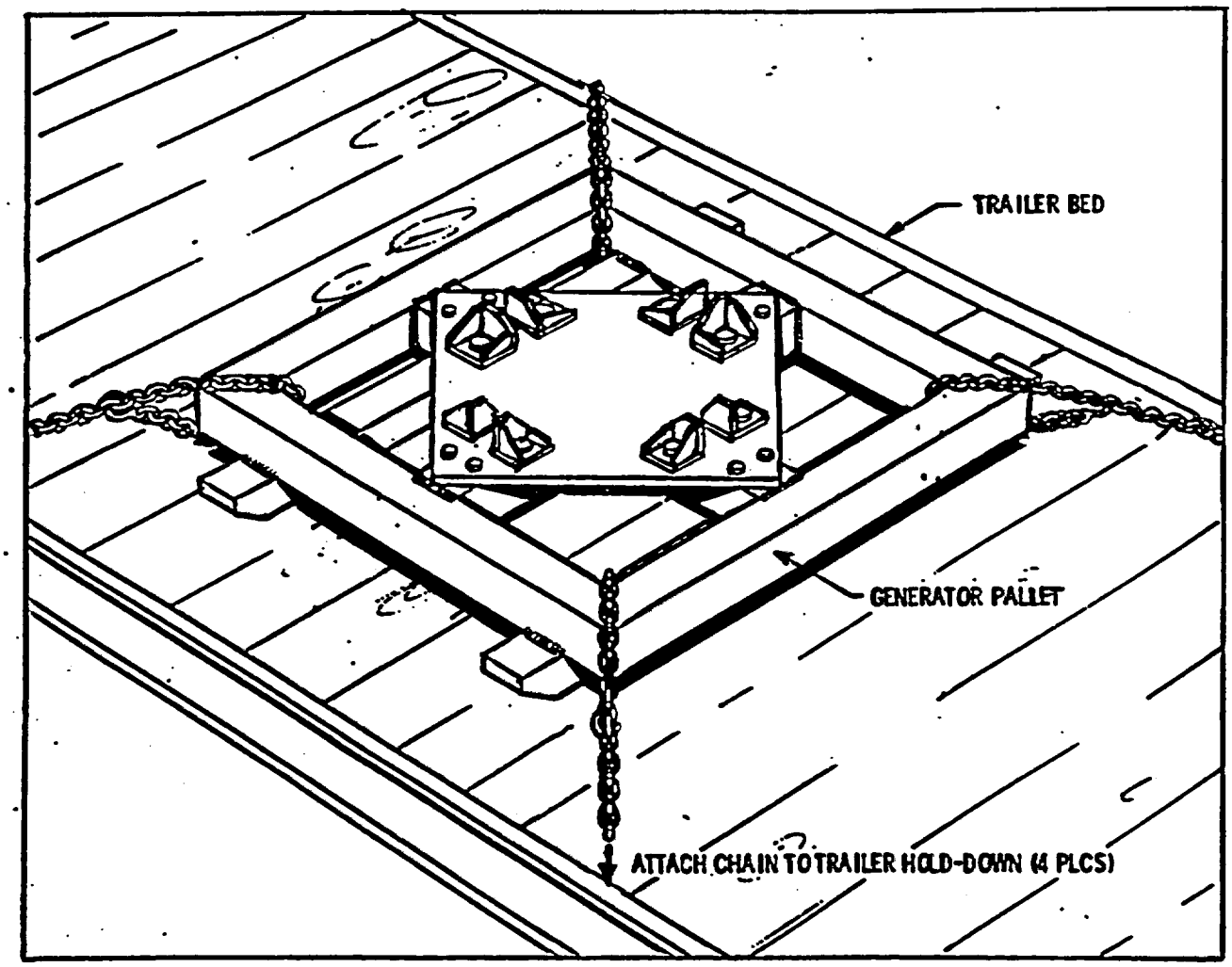

FIGURE E-2. PALLET TIE-DOWN CONFIGURATION

END OF APPENDIX E

APPENDIX F

ACCEPTANCE TEST AND MAINTENANCE PROGRAM

DECEMBER 1991

As discussed in the preface to Revision 2, there are no acceptance tests applicable to the SENTINEL 25 series of packages. In addition, the RTG is basically designed to be maintenance free due to its use primarily in remote, un-attended locations. This chapter deals with the very minor maintenance program required to ensure continued performance of the RTG package.

1. General Testing

There are no structural or pressure testing required to ensure the package performance. "Wipe" testing of the RTG's outer surface to check for the presence of removable radioactive contamination is required prior to the shipment of an RTG (see Chapter VIII). This test verifies that containment has not been breached since the previous shipment and is also the basis for demonstrating compliance with 10 CFR 71.87 (i).

2. Pallet

Prior to each shipment, as a minimum, the steel pallet should be visually inspected for evidence of rust, paint flaking and/or chipping and other signs of general deterioration, the pallet should be wire brushed and painted with one coat of primer and two finish coats of a good grade enamel paint when rusting is evident.

3. Hardware

The hardware that attaches the RTG to its shipping pallet (see Figure E-1) should be inspected prior to each shipment for signs of corrosion, structural damage and other forms of deterioration. The hardware must be replaced with new hardware if structural integrity is in doubt.

END OF APPENDIX F