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7. Abstract

This document provides guidelines for the fabrication of the RTG Transportation System Package Mounting under the Development Control Requirements of WHC-CM-6-1, EP 2.4, Rev. 3

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TRANSPORTATION SYSTEM PACKAGE MOUNTING**

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**WORK PLAN FOR THE FABRICATION OF THE RADIOISOTOPE THERMOELECTRIC GENERATOR
TRANSPORTATION SYSTEM PACKAGE MOUNTING**

1.0 INTRODUCTION

The Radioisotope Thermoelectric Generator (RTG) Transportation System is a dedicated system for the transportation of RTG payloads. The RTG Transportation System (System 100) is comprised of four systems; the Package (System 120), the Semi-Trailer (System 140), the Gas Management (System 160), and the Facility Transport (System 180). The Package Mounting (Subsystem 145) is a subsystem of the Semi-trailer (System 140); it supplies the tiedown points for securing the Package to the Trailer, provides the means for on-loading or off-loading the Package from the Semi-trailer, and provides shock and vibration protection to the RTG during transit operations.

2.0 SCOPE

2.1 OBJECTIVES

This work plan covers the fabrication of the Package Mounting.

2.2 DELIVERABLES

The deliverables covered by this work plan include:

- 1-ea. Package Mounting
- 2-ea. Tiedown Assemblies

3.0 DESCRIPTION

3.1 PHYSICAL DESCRIPTION OF PACKAGE MOUNTING

The Package Mounting consists of a top plate, bottom plate, and eight helical springs. The top plate provides four shackle points, one at each corner of the top plate. The shackle points allow the package to be anchored to the Package Mounting using the Package Mounting tiedown assemblies; they can also be used with lifting slings for moving the Package Mounting alone. Heavy reinforcements to the top plate were required to meet the requirements of 49 CFR 393.102.

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I-beam sections and L-sections were added to prevent bending and twisting of the Package Mounting (Subsystem 145) during the 18 inch drop testing defined in MIL STD 810E.

The bottom plate provides the means of securing the Package Mounting to the Semitrailer (Subsystem 141) floor with Six 3/4 inch bolts. Information supplied by the Semitrailer (Subsystem 141) manufacturer is required to complete the mounting hardware design. The bottom plate also incorporates the forklift pockets for a 10,000 to 25,000 lb capacity forktruck, and a 45,000 to 55,000 lb capacity forktruck.

The Package Mounting relies on eight helical springs to supply the required shock and vibration protection to the RTG device. The helical springs will limit the shock input to the package to 11.2 g's during the MIL-STD-801E Transit Drop Procedure. The springs have a 15% critical damping ratio, this will allow the Package and Package Mounting to bounce when dropped. However, the package will not experience forces greater than the initial impact for any successive bounce. The 80 inch width of the bottom plate ensures that the package will not overturn when the package rebounds after the 18 inch edge drop.

The engineering analysis on the Package Mounting confirms that the Aeroflex isolators will provide the adequate vibration isolation to the package during normal transport. Several input scenarios were chosen to simulate highway transport. These inputs were data from MIL STD 810E, vendor tests of the air ride upper coupler, and the ANSI N14.23 draft. The response of the package for all inputs was well below the limits established in the PacTec Safety Analysis Report for Packaging.

The overall Package Mounting is 80"L x 84"W x 15.75"H. The Package Mounting will be constructed of A36 structural steel.

The Package Mounting is shown in WHC Drawing H-4-302080, the Tiedown Assembly is shown in WHC Drawing H-4-302079.

The RTG Transportation Engineering Flow Diagram (H-4-302033) for Subsystem 145 shows all the Package Mounting interfaces.

3.2 DESCRIPTION OF WORK

The Package Mounting shall be fabricated according to WHC-CM-6-1, EP 2.4. The engineering drawings H-4-302080 and H-4-302079 shall serve as a basis for fabrication.

4.0 TECHNICAL REQUIREMENTS

4.1 PROCUREMENT TASKS

All materials and components shall be procured in accordance with WHC-CM-2-1. Quality assurance inspection will be performed on all procurement and work packages, in accordance with WHC-CM-4-2.

Advanced procurement is encouraged. It is accepted that some equipment procured may not be used in the final assembly due to the development nature of the task.

4.2 MATERIAL REQUIREMENTS

See Drawings H-4-302080 and H-4-302079 for specific material requirements.

Vendor certifications, in accordance with the applicable ASTM (or other) material standard, shall be required for purchased structural steel and welding filler materials. Material certifications on all structural steel shall be traceable the material heat or lot number.

4.3 RESTRICTIONS AND SPECIAL REQUIREMENTS

Engineering changes to the Package Mounting during fabrication process shall be authorized and documented by the cognizant engineer or his designee before the work is performed. The job control system shall be used for the fabrication of the Package Mounting.

Two independent sets of uniquely numbered fabrication drawings shall be maintained with identical information, which will be updated daily. All changes to H-4-302080 or H-4-302079 shall be marked on a copy of the drawings marked "DEVELOPMENT CONTROLLED COPY" in red ink. All changes shall be identified, numbered and dated on the drawing. Each change shall be signed by the cognizant engineer or his designee. A log book shall be maintained documenting all changes to the drawings. The changes shall be identified in the log book by the corresponding number on the drawing. Each logbook entry shall have the following information: a description of the change to the drawing, the drawing number, the sheet number and drawing zone effected by the change, the date of the change, and each entry shall be initialled by the cognizant engineer or his designee. The logbook shall be updated with every change made to the drawing.

4.4 FABRICATION DRAWINGS

All fabrication shall be completed per WHC drawings or sketches. The electronic files of drawings H-4-302080 and H-302079 shall be updated at the

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end of each day, if any changes to the drawing were made. When fabrication is complete the drawings will be incorporated into appropriate engineering documents (as-built drawing).

4.5 COSTS AND SCHEDULE

A charge code or work order number for the fabrication of the Package Mounting shall be provided to Support Services. Fabrication and delivery of the Package Mounting shall follow the RTG Transportation System Schedule (Item # 513231405080).

4.6 VERIFICATION, WITNESS, INSPECTION AND HOLD POINTS

Verification, inspection, witness and hold points for fabrication will be established in the fabrication traveller generated by Support Services.

QA inspection points for fabrication shall be approved by QA prior to start of fabrication.

4.7 SPECIAL TESTING REQUIREMENTS

There are no special testing requirements for fabrication of the Package Mounting.

4.8 SAFETY CLASS AND APPROVAL DESIGNATOR

The Package Mounting safety class is 3 per WHC-CM-4-46, Table 1, Item 3. The Package Mounting approval designator is Q per WHC-CM-3-5, T4.1.

4.9 SHIPPING AND HANDLING

The finished Package Mounting shall be shipped to and stored in Room 173 of the 306 Building in the 300 Area of the Hanford Site. The cognizant engineer shall arrange for the shipping of the Package Mounting and the tiedowns with WHC Transportation.

5.0 QUALITY ASSURANCE REQUIREMENTS

5.1 DESIGN VERIFICATION AND CONTROL

The DEVELOPMENT CONTROLLED COPY shall be compared to the as-built drawings and signed off by a Quality Assurance representative and the Cognizant Engineer

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before the drawing is ECN'd and released according to EP-1.7, "Engineering Document Approval and Release Requirements".

5.2 QUALITY ASSURANCE PROGRAM REQUIREMENTS

The tasks associated with this work plan shall meet the requirements of WHC-CM-4-2.

6.0 REFERENCES

MIL-STD-810E, 1989, *Military Standard*, "Environmental Test Methods and Engineering Guidelines."

Packaging Technology, Incorporated, 1993, "RTG Transportation System-Draft Safety Analysis Report for Packaging."

WHC, 1994g, *RTG Transportation System Package Mounting Assembly*, Drawing No. H-4-302079, Westinghouse Hanford Company, Richland, Washington.

WHC, 1994g, *RTG Transportation System Package Mounting Assembly*, Drawing No. H-4-302080, Westinghouse Hanford Company, Richland, Washington.

WHC, 1994h, *Functions and Requirements for the Radioisotope Thermoelectric Generator Transportation System (System 100)*, WHC-SD-RTG-FRD-001, Rev. 1, Westinghouse Hanford Company, Richland Washington.

WHC, 1993h, *Specification for RTG Package Transportation System*, WHC-S-4025, Rev. 3, Westinghouse Hanford Company, Richland Washington.

49 CFR 393, 1988, "Parts and Accessories for Safe Operation," *Code of Federal Regulations*, as amended.