PDR 71-9510

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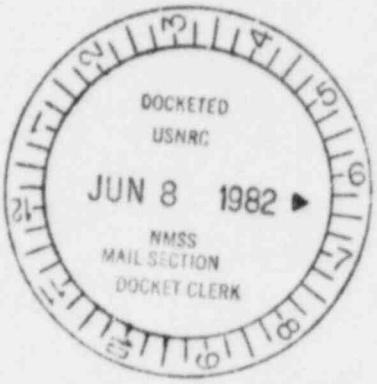
Department of Energy
Washington, D.C. 20545

JUN 01 1982



Mr. C. E. MacDonald
Chief of Transportation
Certification Branch
Division of Fuel Cycle and
Material Safety
U.S. Nuclear Regulatory Commission
Willste Buildi.., Mail Stop 396-SF
Washington, D.C. 20555

Dear Mr. MacDonald:

Enclosed are eight copies of the SARP for Certificate of Compliance USA/9510/BLF (DOE-AL).

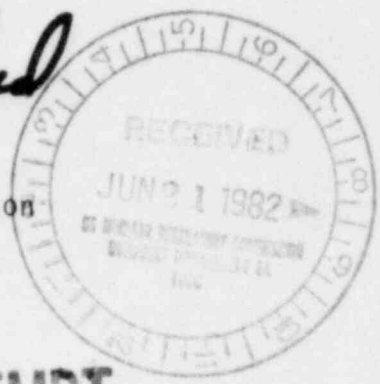
The certificate is on Page 65 of the report. We are also including eight copies of the engineering evaluation of the SARP prepared at the field office.

A low priority for NRC review of this report is appropriate as no use by licensees can be anticipated. Incidentally, you can see by the following signature that the packaging safety program has been reorganized and is no longer under Dr. Ross. You can address requests for information to me, and we should plan to get together in the future.

Sincerely,

R. P. Prichard

Reuben P. Prichard
Acting Director
Safety Engineering
and Analysis Division



Enclosure:
8 copies Rpt. MLM-2857
and Engineering Summary

cc w/encl.
R. R. Rawl, DOT

FEE EXEMPT

20799

EVALUATION OF SARP FOR THE GENERAL PURPOSE HEAT SOURCE
MODULE 750-WATT SHIPPING CONTAINER

Structural Integrity - The adequacy of the structure of the GPHS container was demonstrated by both calculation and actual tests. Particularly significant was the successful drop tests of both the entire container with simulated contents and the tests of the bare stainless steel can (SSC). Damage in all cases was minimal and subsequent testing of the SSCs revealed that they remained leaktight.

The GPHS is designed to withstand the conditions encountered in launch conditions and re-entry from space. Thus, the requirement for double containment (the SSC) is probably unnecessary. It does, however, provide additional assurance that no radioactive material will be released.

The results of the puncture test were derived from calculations. The energy required to penetrate the cask cover was shown to be 56 times the energy available from the 40-inch drop.

The 4-foot free drop was not evaluated since it was deemed that the two 30-foot drops adequately demonstrated that any drop of 4 feet would cause minimal damage--probably only to the cage structure.

The penetration test of the 13 pound, 1½-inch diameter steel cylinder was shown by calculation to require about 770 times the available energy in order to penetrate the bottom (thinnest part) of the cask. No credit was taken for the steel mesh which would probably keep the steel cylinder from striking the cask.

Compression of the cask was also evaluated by calculation. It was found that the critical buckling stress was some 300,000 times greater than the applied stress would be under the regulatory compression loading. This could be expected since the cask approximates a short, thick-walled (4 in.) cylinder.

Calculations and tests for lifting and tiedown points showed that the structure was adequate and would not affect the containment capabilities of the cask.

Thermal Resistance - The GPHS cask was subjected to the required fire test in a burn chamber. Some melting of the aluminum fins occurred, and it was found during the immersion test that a small leak had developed after 24 hours under water. The SSCs were found to be leaktight and it is expected that the GPHS units would not be damaged and would, therefore, also remain leaktight. No loss of radioactive material would occur.

Temperature extremes of heat and cold were evaluated and it was found that with heat input from the sun that the cask temperature would not be increased by more than 4° F. With very cold temperatures the effectiveness of the cask would not be reduced and it may be that the cold would actually be beneficial.

Cask temperatures at steady states were investigated by the use of Rite heat sources of 820 and 420 watts respectively. A 500 watt heating tape was used to determine the temperatures in the SSCs. The maximum cask temperature (with 820 watts) was found to be 150° F, well within the capabilities of the cask. The SSC, with a heat load of 300 watts reached a temperature of 608° F, which is not excessive for this container.

Radiation Shielding - Radiation measurements were made utilizing the Rite heat sources (420 and 820 watts) previously mentioned. Interpolation of the dose rates measured from these sources showed that the 750 watt GPHS will have radiation levels well within the DOT requirements of 200 mr/hr at the surface of the package. Accident conditions will also result in radiation levels which are within the regulatory requirements.

Criticality - Criticality safety was determined by use of ANSI 16.5, 1975, "Guide for Nuclear Criticality Safety in the Storage of Fissile Materials". It was found that with a loading of 1.5 Kg of Pu-238 that a total of 4400 packages would comprise a sub-critical array. A check on this value was made using the Density Analog method. Using a load of 1.5 Kg of Pu-238 per package, it was found that it would take 8930 containers to go critical. Both of these values far exceed the 2500 containers we regard as being an "unlimited" number. The GPHS container can, therefore, be shipped as Fissile Class I.

Quality Assurance - Since the GPHS containers are modified SNAP-19 containers, there was no opportunity for initial fabrication in accordance with an established GPHS QA program. Nevertheless, the containers were built under the SNAP-19 QA program which assured that the basic container met high standards. The primary modifications were the machining out of a step on the inside of the cask and the boring of holes to attach the cask to the cage.

The QA documents in the SARP are primarily concerned with the fabrication of the SSCs which are procured in accordance with the well-established QA program at Mound Facility.

Normally, in heat sources for space applications, primary reliance is placed on the heat source construction for containment. This is because the sources are designed to meet the severe requirements of surviving the launch and re-entry environments. The QA for space systems is, therefore, especially rigorous.

Summary - In summary, the tests and calculations show that the GPHS cask meets or exceeds regulatory requirements. The structure is adequate; thermal capabilities are well within the heat loads imposed by the authorized contents and/or accident conditions; radiation levels are not excessive; criticality poses no restrictions due to the amount and types of material (Pu-238) involved and the QA involved is assured in the cask, SSCs and GPHS units.

Conservative assumptions were used and generally accepted equations and values for material properties were applied in determining compliance.