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ICC REFERAL OF ATOMICS INTERNATIONAL'S TERRESTRIAL ISOTOPE HEAT SOURCE

In an application dated December 5, 1966, Atomics International requested an AEC authorization to ship a 14 kilocurie Pm-147 heat source. Since Atomics International is located in an agreement state, California, I telephoned AI and informed them that their authorization could only be issued by ICC. AI, therefore agreed to notify the ICC of their need for a shipping authorization. Subsequently, we received a letter, dated January 3, 1967 from ICC requesting our review of the AI's application for approval to transport four of these heat sources in a specified ICC container. In the following section, I have briefly described the devices and summarized the results of our technical analysis which indicates that these heat sources will meet the standards of 10 CFR 71 if shipped by themselves or packaged in the ICC five gallon container.

Safety Analysis

The 5 thermal watt terrestrial heat source is a right circular cylinder approximately 1½ inches in diameter by 1½ inches high, with a handling ring attached to a lip on the top of the device. The 14 kilocurie Pm-147 oxide source is encapsulated in a 0.605 inch diameter Tantalum-10 Tungsten alloy cylinder which is welded closed. The source cylinder is eccentrically located inside a 1.52 inch diameter welded closed cylinder of Uranium-3 Molybdenum alloy which provides (1) a leak-tight secondary encapsulation barrier and (2) the radiation shielding to reduce the surface dose rate to acceptable levels. The Uranium-3 Molybdenum cylinder is further encapsulated in a stainless steel container which has 30-mil walls and 60-mil end caps. The outer stainless steel container is welded closed and provides a barrier against oxidation of the Uranium-3 Molybdenum alloy. The heater contains approximately 2.1 pounds of depleted uranium. The four heaters will be shipped in a five gallon ICC specification container. The heat sources will be held in place within the container by wooden braces and steel wool.

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Our review of these heat sources against the standards of Part 71 was greatly simplified by the results of a testing program which AI conducted to determine suitable materials and fabrication techniques for these heat sources. The testing program was conducted by subjecting 6 heat sources loaded with a similar, but non-radioactive fuel, samarium oxide, to each of the following environments and forces: (1) 2200°F for 1 hour, (2) 2000°F soak to room temperature by dousing with water, (3) an external pressure of 3000 psig, (4) a 30 ft. drop onto 1/8-inch diameter rounded pin, (5) a 20,000 lbs crushing force (6) 10,000 lbs shearing force, (7) 500 ft/sec impact onto a granite block and (8) vibration of 0.5 inch amplitude at 20-35 cycles per sec. Following these tests, leak tests were performed on each heat source using an acceptance criterion of 1.0 x 10^{-7} cc/sec, and all six successfully met this limit. Based on the results of these leak-tests, and the fact that these test environments and forces are more severe than those specified in Sections 71.31, 71.32 and Appendixes A and B of Part 71, I conclude that each individual heat source can meet the standards of 10 CFR 71.

Since each of these heat sources meets the standards of 10 CFR 71, and our analysis indicates that packaging of four heat sources in the ICC specification five-gallon container will not affect the ability of these sources to meet Part 71, this type of shipment will also satisfy the standards of 10 CFR 71.

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