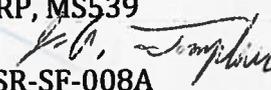


**memorandum**

To: Justin M. Griffin, OSRP, MS539  
From: J.A. Tompkins, CHP   
Symbol: NEN-3: 17-010 OSR-SF-008A  
Date: March 6, 2017

NEN-3: International Threat Reduction  
Off-Site Source Recovery Program (OSRP)

**SUBJECT: Monsanto Research Corp. model 24128 (NALA 80) Addendum  
- Special Form Re- Evaluation**

*SCOPE*

The purpose of this memo is to characterize Monsanto Research Corp. model 24128 radioactive sealed sources as US DOT Special Form Radioactive material, with the goal of achieving, shipment, consolidation, and interim storage, and final disposition at WIPP.

*DOCUMENTATION*

In September of 1971, Texas Nuclear contracted with Monsanto Research Corp (MRC) to fabricate several model 24128 "pancake" sources containing Pu-238. These sources were double encapsulated, stainless steel, neutron sources containing a mixture of beryllium metal and up to 12 Ci of Pu-238. The prototype model 24128 went through 3 minor manufacturing revisions in-order to simplify fabrication issues. The Rev. 2 revision made the cladding head thickness 0.015" thicker, which strengthened the overall design. Overall testing at this stage was ANSI classification testing and the special form temperature testing. This source was evaluated ANSI N542-1977 (Sealed Radioactive Sources - Classification) standard as meeting a classification of 68E44344.

*SPECIAL FORM ANALYSIS*

In 1980, another version of the model 24128 was introduced as the model 24143. This version was 0.150" greater in length (thickness). In all other aspects these two source capsules are identical.

The MRC models 24128 and 24143 were given a complete set of special form tests under USDOT 49CFR 173.398. These tests included: temperature tests (1475° F), impact, external pressure, vibration, and puncture. Both models passed all tests without any indication of leakage (He leak test). The MRC model 24128 was certified as special form by the USDOT with the issuance of COCA USA/0241/S. This COCA expired in 1986.

*ADDITIONAL TESTING*

In 1981, an additional set of potentially destructive tests were conducted. These tests were aimed at examining the longevity of these two models with respect to self-pressurization due to fully contained alpha decay within each source. This additional testing internally pressurized a model 24128 source with a hydraulic pump to a series of test pressures (550, 600, 1200, 1500 psi) for 10 cycles. The only change in the test items was a slight concavity of the test article due to the 1500 psi test pressure. Chief mechanical engineer for source

design, Edward Janzow, estimated the special form, life time to be 20 yrs., with a source activity of 10 Ci, of Pu-238.

#### *PHYSICAL FEATURES OF THE MODEL 24128 (NALA 80)*

The model 24128 sealed source was a cylindrical double encapsulation made of welded stainless steel. Radioactive contents for the NALA series of sources fabricated for Texas Nuclear were limited to 185 GBq (5 Ci) of Pu-238 for many of these. This neutron source contained a mixture of beryllium metal and Pu-238 oxide. This loading was much less than the original maximum design loading of 474 GBq (12 Ci) of COCA USA/0241/S, or even the 370 GBq (10 Ci) loading assumed for the 1981 test series. If the typical activity loading for NALA sources (5 Ci) was one half of the assumed loading (10 Ci) then the rate of self-pressurization was one half as well. This indicates that the special form life time for a Model 24128 source loaded at 185 GBq (5 Ci) is twice as long as the chief engineers conservative estimate of 20 yrs., thus 40+ years. The plus after the 40 years is there to emphasize that an additional factor of 20% was used to reduce risk further than indicated by the calculations. The actual special form life may be as long as 48 years for a model 24128 in excellent physical condition (dimensional inspection) and exhibiting no indications of leakage (leak test) or other visible failings (corrosion).

#### *SUMMARY*

The MRC model 24128 and 24143 are "pancake" type source manufactured for Texas Nuclear (now Thermo-Fisher). Even after 40 years of service these sources in excellent physical condition will continue to exhibit the physical integrity required for special form sealed sources if loaded at 5 Ci of activity or less, and in excellent condition.

#### *CONCLUSION*

The MRC model 24128 & 24143 radioactive sealed source as documented in the manufacturing order and drawings can be self-certified as US DOT special form radioactive material, within the limits and scope of this memo until June 1, 2021, a RWL of 40 years. After June 1, 2021 all MRC model 24128 and 24143 radioactive sealed source shipped by as normal form radioactive material unless they are re-encapsulated. .

Encl.:

- A. TWCP 05659, Special form engineering analysis by Dr. Edward Janzow, MRC
- B. Ltr Report from K. Flayler, Manager Technical Requirements, MRC, Dayton Laboratory (24 April, 1981), to J. Hedrick, Texas Nuclear Corp.