NEUTRON PRODUCTS inc

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15 October 2015

ATTN: Document Control Desk
Director, Division of Spent Fuel Management
Office of Nuclear Material Safeguards and Security
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555-0001

To Whom It May Concern:

As required by 10CFR71, (71.95), Neutron Products, Inc. is submitting this report to describe:

a non-conforming package component that was identified while the component was being repaired on 17-18 August 2015; and,

the resulting investigation which uncovered non-conforming components of other packages.

The requirements in ***71.95, Reports***, and responses are referenced by letter and number as follows:

(c) (1) A brief abstract describing the major occurrences during the event, including all component or system failures that contributed to the event and significant corrective action taken or planned to prevent recurrence.

There were no component failures that contributed to this event.

The initial finding concerned the outer metal shell of OP-8, which is a component of the Certificate of Compliance USA/9215/B(U) packaging. While at an approved vendor for repair of a small tear on the sidewall of the outer metal shell, OP-8 was found to have corrosion between two metal surfaces. The corrosion was not visible from the outside of the package. However, on the inside of the metal shell, there was a small hole in the 12 gauge metal behind the 2 x 2 x 3/16 angle which forms the flange on the metal shell body which mates to a similar flange on the metal shell lid.

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The affected area of 12 gauge material was removed, and pitting corrosion was observed between the 12 gauge sidewall and the 2 x 2 x 3/16 angle behind it. The top weld attaching the 12 gauge steel to the angle was a stitch weld, so it was suspected that the corrosion might extend in a 2" wide band around the circumference of the metal shell. Subsequent ultrasonic testing on other areas around the same adjoining surfaces confirmed measurements below the mill tolerance for minimum thickness of the parent materials, indicating that this area had, in fact, been subject to internal corrosion. As the overpack lid has a similar construction, that area was also examined using non-destructive testing and was found to have the same problem, with a 2" wide band of internal corrosion in the area between the 12 gauge shell and the 2 x 2 x 3/16 angle which forms the flange. The corrosion was not visible from either the outside of the lid or the inside of the lid but, based upon the ultrasonic testing, it was apparent that there had been a modest loss of thickness of both the 12 gauge shell and the vertical leg of the angle in that area.

Neutron promptly suspended all activities using the USA/9215/B(U) packages until the other packaging could be evaluated for similar defects in order to determine the extent of the problem. In order to investigate other possible thickness nonconformances, it was decided that all overpacks should undergo ultrasonic testing on the flange area (which was identified as affected on OP-8), as well as on other metal surfaces.

Initial indications are that two other over packs (OP-10A and OP-11) had a similar problem in the flange area of both the metal shell body and lid. Preliminary indications are that OP's 12, 13 and 14 do not have the same corrosion problem, but do have thickness nonconformances associated with the bottom of the metal shell. In this case, it is not that the metal has undergone corrosion but rather that its thickness is modestly greater than the maximum mill tolerance for the parent material specified on the drawing.

We are in the process of repairing the affected overpacks. In addition, we are in the process of significantly upgrading our capabilities to detect this type of nonconformance. We have purchased an ultrasonic testing device of our own, are in the process of finalizing the procedure for its use, have specified personnel training requirements, and are modifying the scope of annual inspections to include ultrasonic testing of suspect areas and quantifiable measurements of additional areas on package components.

(c) (2) (i) Status of components or systems that were inoperable at the start of the event and that contributed to the event.

There were no components or systems of the packaging that were inoperable at the start of the event. The problem identified on OP-8 is in the process of being repaired by an approved vendor. OP-12 has been evaluated by an approved vendor, and is next to be repaired. It is

anticipated that the metal shells will be evaluated and repaired one or two at a time until they have been restored to conforming status.

(c) (2) (ii) Date and approximate times of occurrences.

The initial package affected was OP-8. The subsequent evaluation has determined that all overpacks are affected in one way or another. The packaging has been used for shipping special form cobalt-60 sources since the 1980s.

August 17-18, 2015 - Outer metal shell of OP-8 was at the site of an approved vendor undergoing repairs of damages previously identified. Vendor personnel found a small hole on the inside wall near the top of the body of the steel shell. The hole did not extend through to the outside of the overpack.

August 18, 2015 - The hole was evaluated by a qualified engineer and the evaluation and repair was approved by Neutron Products personnel including the Quality Assurance Manager Radioactive Transportation, Neutron Products, Inc. (QAMRT) who was onsite for inspection of the original repairs. A small section of the 12 gauge steel around the small hole was removed in accordance with the repair plan. Corrosion was found on the inside of the 12 gauge wall and the adjoining steel angle (lid flange main body). The qualified engineer thought that the corrosion found between the side wall and steel angle could be occurring in other areas around the inside of the flange. Those areas sounded solid when tapped on with a hammer. However, when the results of this test were discussed with other Neutron Products personnel, and in consultation with the vendor performing the evaluation and repairs, it was decided to have the vendor perform ultrasonic testing to measure the thickness of both parent materials. The test revealed a measurable loss of material on the steel side wall and steel angle. The same areas on the lid of the outer steel shell were inspected by ultrasonic testing and were found to have similar measurable loss of material.

Also on August 18, 2015, after a discussion with Neutron Products personnel, the QAMRT decided to suspend RAM shipping activities for all packaging until they were similarly inspected for corrosion in these and other possible areas of internal corrosion. All Neutron Products personnel who handle and ship the USA/9215/B(U) packages were verbally notified of the suspension of RAM shipping.

The other active registered user of the package, as well as other customers, were also promptly notified.

August 19, 2015 - We requested that the other two empty over packs, which were at a customer site in preparation for loading with radioactive material for an upcoming shipment, be shipped (empty) back to Neutron Products for inspection.

August 28, 2015 - The other two over packs (OP10A and OP-11) were received at Neutron Products. Preliminary indications are that these two overpacks have similar thickness nonconformances in the flange area.

September, 11, 2015 – In the meantime, OP-12 was shipped from a customer to the approved vendor for evaluation and potential repair. That evaluation found no corrosion in the flange area, but did identify thickness nonconformances on the bottom of the metal shell, where two pieces of metal were identified to have thicknesses greater than the mill tolerance for the steel specified in the applicable drawing.

(c) (2) (iii) The cause of each component or system failure, or personal error, if known.

The corrosion found between the steel side wall and lid angle was likely caused by water and/or humidity entering the area between the metal surfaces. The thickness nonconformances on the bottom of OP 12, (and likely 13 and 14) were caused initially by an inattention to detail and subsequently by Neutron's lack of the capability to accurately measure metal thickness from only one side (a capability which Neutron is in the process of adding to its program). The QAP previously identified inattention to detail as a programmatic weakness, since which time considerable effort has been devoted to finding problems within the program. As embarrassing as it may be, the inescapable result of success in that effort is that problems will be found which were previously not detected. The thickness nonconformances reported herein are one such example.

(c) (2) (iv) The failure mode, mechanism, and effect of each failed component, if known.

There were no failures of the function of the package and no practical effect on the safety of the package resulting from this deficiency. The mechanism for the formation of the small hole was metal corrosion by water.

(c) (2) (v) A list of systems or secondary functions that were also affected for failures of components with multiple functions.

There were no systems or secondary functions which were affected.

(c) (2) (vi) The method of discovery of each component or system failure or procedural error.

The small hole on the inside of the outer metal shell sidewall was discovered by visual inspection when the overpack had been disassembled for repair of a different nonconformance previously reported. The subsequent nonconformances were identified by the system-wide evaluation which followed the initial finding. Those nonconformances were identified by the use of ultrasonic testing.

(c) (2) (vii) For each human performance related root cause, a discussion of the cause(s) and circumstances.

The corrosion that was discovered between the two surfaces on the outer metal shell likely occurred over the lifetime of the package component. While Neutron Products now stores all packaging components on the inside of storage facilities in a dry location, that has not always been the case and empty packages are sometimes opened and closed at foreign locations on the outside of facilities when it is raining. Neutron Products attempts to minimize these situations by directing receiving personnel to handle and store packaging in dry locations.

In addition, Neutron had not previously identified metal thickness as a potential area of non-conformance. Ultrasonic thickness measurement equipment has been commercially available for many years, but because Neutron had not identified the potential problem, it failed to make the technology available to its inspection personnel.

(c) (2) (viii) The manufacturer and model number (or other identification) of each component that failed during the event.

The package certificate is USA/9215/B(U). OP's 8, 10A and 11 were fabricated by Danzer of Hagerstown, MD. OP's 12, 13 and 14 were manufactured by Koontz of Taneytown, MD. As noted in (c) (2) (iv), there was no failure of the function of any package components.

(c) (2) (ix) For events occurring during use of a packaging, the quantities and chemical and physical form(s) of the package contents.

Over the years, the packages have been used for thousands of shipments containing radioactive material. The current certificate limits are:

- cobalt-60, special form sources, up to 15,000 curies; and,
- cesium-137, special form sources, up to 20,000 curies.

(3) An assessment of the safety consequences and implications of the event. This assessment must include the availability of other systems or components that could have performed the same function as the components and systems that failed during the event.

There were no failures of packaging components during the shipments/event. The shipments were conducted safely and there were no safety consequences as a result of the shipments. In assessing the potential safety consequences of these nonconformances, it should be noted that the SAR does not give a lot of credit for the 12 gauge sidewall of the outer metal shell, which was not designed to be a precisely machined component of the package. It routinely gets dinged and dented during the course of routine shipping activities and – in some respects – it is considered to be somewhat sacrificial. That said, we rely upon it to be basically sound and intact in order to play its role. Although some of the metal in the 2" wide band had been corroded to a thickness below the mill tolerance for the material specified, the metal shell remained intact, with its basic features in place, and maintained its ability to perform its safety and containment functions.

The 12 gauge material on the body of the metal shell averaged approximately 0.081" over the twelve points tested in the 2" wide band, whereas the mill tolerance for 12 gauge steel extends only as low as 0.0966". Similarly, the vertical leg of the 2 x 2 x 3/16 angle which wraps around the outside of the 12 gauge shell measured an average of 0.157", which is below the lower end of the mill tolerance of 0.1775". For the lid, the averages of the sidewall and angle points tested were 0.090" and 0.175" respectively. The corrosion problem did not affect the 12 gauge material in areas of the sidewall where it was not backed up by the 2 x 2 x 3/16 angle.

The principle role of the 2 x 2 x 3/16 angle is to serve as a flange in order to connect the lid to the body of the metal shell. In the SAR, structural benefit derived from the presence of either the 12 gauge sidewall or the flange is not considered in any of the drop test calculations.

In addition, for the penetration test, clearly the metal shell is more vulnerable in areas of the sidewall constructed only of 12 gauge material (which did not show signs of corrosion), than in the flange area where, even considering the loss of material due to corrosion, the total metal thickness of the 12 gauge and the angle combined was more than double the thickness of conforming 12 gauge which makes up the rest of the sidewall.

Regarding the bottom of the metal shell, the slightly heavier material would make the metal shell marginally more protective of its contents and it is not credible that any adverse potential safety consequences resulted from the nonconforming material.

Neither the small hole in the 12 gauge material on OP-8, nor the thickness nonconformances on OP-8 and the other packages were known when the shipments were made, and so no alternative packaging was considered prior to making the shipments.

(4) A description of any corrective actions planned as a result of the event, including the means employed to repair any defects, and actions taken to reduce the probability of similar events occurring in the future.

The loss of material in the outer metal shell of OP-8 has been evaluated and repairs in accordance with Neutron's Quality Assurance Program are in progress at the site of an approved vendor. Repairs will include replacement of the affected parent material with certified material supplied by the vendor. Repairs will result in the restoration of the outer steel shell to specifications on the approved drawing for the component. The seal weld on the repaired component will be painted and maintained in order to prevent future incursions of water or humidity.

A similar repair plan is underway for OP-12, the shop traveler has been created and approved and repairs are expected to begin soon after the repairs to OP-8 have been completed.

Corrective/preventive action is expected to include enhanced storage, handling, and maintenance requirements, and significant upgrades in the scope of annual inspections to include ultrasonic testing of suspect areas and quantifiable measurements of additional areas on package components.

(5) Reference to any previous similar events involving the same packaging that are known to the licensee or certificate holder.

There has been one similar incident of loss of material being detected during the life of the packaging. Overpack OP-9 had been leased to a US company which ultimately went out of business. The overpack was stored outside in the country of Colombia for period of approximately nine years while Neutron Products attempted to locate and ship the package back to the United States. This storage condition resulted in the beam runners on the bottom of the outer steel shell to be severely corroded while sitting in wet earth and water.

Other damage in the form of gouges/dents have occurred, resulted in loss of material and were repaired in accordance with approved procedures.

(6) The name and telephone number of a person within the licensee's organization who is knowledgeable about the event and can provide additional information.

Jerry L. Fogle, QA Manager for Radioactive Transportation – 304 725-7041

(7) The extent of exposure of individuals to radiation or to radioactive materials without identification of individuals by name.

There was no exposure to radiation or radioactive materials to any individuals beyond normal handling as a result of this nonconformance.

We believe that this letter fulfills the requirements of 71.95 Reports. If you require any additional information, please contact Jerry Fogle at 304 725-7041 or neutron@wvinc.comcastbiz.net. If he is unavailable at that phone number, he can be reached through our main office at 301 349-5001. Alternatively, I can be contacted directly at the main office.

Respectfully submitted,

Neutron Products, Inc.

William L. Ransohoff
President

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