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Your ref:

Our ref: UAM-07-31

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SUBJECT: Docket 71-6078, Certificate of Compliance No. USA/6078/AF, 927A1/927C1 Shipping Package – Event Report Supplement

A written report was submitted in compliance with 10 CFR 71.95 on April 07, 2007 (Our ref. UAM-07-31). The written report was for an instance in which the conditions of approval in the Certificate of Compliance for Model 927A1/927C1 (USA/6078/AF) were not observed in making a shipment.

The narrative description of the events provided in the notice on April 07, 2007, have been revised after completing the causal analysis for both events. The revised narrative descriptions are included as enclosures. I hereby affirm that the statements made in this report are true and correct to the best of my knowledge and belief.

Please direct any questions to Peter Vescovi at (803) 647-3167.

Sincerely,

Electronically approved*

Peter J. Vescovi
WESTINGHOUSE ELECTRIC COMPANY, LLC
Global Supply Chain Management
Licensing, Compliance and Package Technology

**** Electronically approved records are authenticated in the Electronic Document Management System.***

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Enclosures

1. Event description for 927A1/927C1 (USA/6078/AF) - Loose cover bolts and water inside package (revised)

2. Event description for 927A1/927C1 (USA/6078/AF) - Failure of label to contain the transport index (revised)

cc with enclosures

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Event description for 927A1/927C1 (USA/6078/AF)
Loose cover bolts and water inside package (Revised)

(1) Summary of event

The CoC requires the package be prepared for shipment and operated in accordance with the Operating Procedures in Chapter 7 of the application. During fuel receipt a customer noted that the some closure bolts were only hand tight and a small amount of water had collected in the bottom of the package.

The criticality safety case assumes water leakage into the package during the accident conditions of transport. Preventing leakage into the package or excluding water from being inside the package is not a condition of the CoC, but it is the intended function of the packaging to keep the contents dry during routine and normal conditions of transport. Cover fasteners keep the outer packaging intact during the design basis impact and provide a compressive force on a seal that may be used to prevent water from entering the package during routine and normal conditions of transport. Cover fasteners that do not remain fully tightened during routine shipping conditions is a failure to observe conditions of approval in the CoC. Operating procedures for the package require that the container cover bolts are fastened, but both the Operating Procedures in Chapter 7 of the application and specification for site allow a small amount of water in the package.

.(2) Description of Event

(i) Event Chronology

On Thursday, January 18, 2007, the packing area operator packed shipping container C5827 using approved operating procedures. Shipping Container C5827 was shipped on January 29, 2007 and arrived at the customer's site on January 31, 2007.

On February 5, 2007 during the new fuel receipt the customer observed that shipping container C5827 had seven loose flange bolts on the container. Two of the loose bolts were on the vent end, and five were on the left side facing the vent. Approximately one gallon of water was also observed in the bottom of the shipping container. The responsible Engineer created a Field Anomaly Report and the customer submitted a Vendor Corrective Action Report.

(ii) Process Description

A checklist requires the operator to torque the closure bolts as well as verify that the cl;osure bolts are tight. The operator initialed both of the sections which indicated these actions were completed. A second transport operator independently checked the same

bolts for tightness prior to shipping the package. Model 927 packages are stacked for storage prior loading and packages are stacked two high on the truck trailer. The packages are secured to the truck trailer with hold-down straps.

(iii) Causal Factors

The apparent cause of the loose bolts is that some flanges are warped to the extent that the specified torque for the cover fasteners does not provide sufficient clamping force to compress the flange. In transport, due to the combined force of the weight of a containers stacked on top and forced applied by the hold-down straps, the flange is compressed more. The compression resulted in the bolts being loose during transport. The water in the bottom of the shipping container is possibly due to the loose bolts resulting in the o-ring not sealing the container.

Ownership of the Model 927 package was transferred to from CE Nuclear Power, LLC, to Westinghouse Electric Company in 2000. Appendix 2A of the application for approval allows either of three bolts for container closure. The Bolt-special (SAE C-1010) has been used for container closure since Westinghouse started using the Model 927. This bolt drawing specifies a ½-13 UNC-2A SAE Grade 1. The tensile strength for a SAE Grade 1 bolt is 75 ksi and standard dry torque specification of about 50 foot-pounds. Section 7, Operating Procedures, has no specification for tightening other than that cover bolts are fastened. During the first two years of package operation by Westinghouse the cover bolts were fastened using an impact wrench. Securing the fasteners with no specification on the maximum torque resulted in damage to bolt thread and bolts were shearing when removed during unloading operations.

In July 2002 Westinghouse created a manufacturing drawing to specify the same type of bolt closure as in Appendix 2A, but increased the minimum tensile strength specification to 125 ksi to prevent bolt damage occurring during package operation. The 927 Shipping Package T-bolt drawing (Westinghouse dwg. No. 4184C80) specifies ASTM A193 (Standard Specification for Alloy-Steel and Stainless Steel Bolting Material for High-Temperature Service) Grade B7 or approved equal with a minimum tensile strength of 125,000 psi. that was used to procure replacement closure bolts. The replacement bolts were specified as ASTM A193 Grade B bolts is a specification similar to SAE Grade 5. .

Prior to replacing all the SAE Grade 1 bolts with the replacement bolts, the Westinghouse operating procedure for loading the Model 927 was revised in October 2003 to include a torque specification of 25-30 foot-pounds This range was specified to be stay below the yield strength, 0.2 % offset, that is 30 ksi for the SAE Grade 1 bolt that were still be in use. Eventually all the bolts were replaced with bolts meeting the ASTM A193 Grade B7 bolt specification having a tensile strength of 125 ksi, However, the torque specification in the procedures remained at a value specified to SAE Grade 1 bolts. The specification of the torque this torque may have resulted in less compressive force than was applied when bolts were tightened with impact wrenches and there was

no specification. Consequently, stacking the packages during routine transport could compress the seal or flanges and result in loose cover fasteners. Although the operating procedure was revised to ensure that the yield strength of Grade 1 bolts was not exceed, the change did not consider the effect of reducing the compressive forces on the closure flanges. The change in closure bolt specification would have permitted a higher torque, but this was not considered at the time because the change to specification of mechanical requirements was intended to prevent closure bolt damage.

(3) Safety Consequences and Implications of the Event

Approval of the Model 927 package is based on tests conducted to demonstrate compliance with 10 CFR 71 Subpart F-Package, Special Form, and LSA-III Tests. These tests were done using a 927 packaging and contents to simulate an actual fuel assembly. Closure bolts for the container were tightened for normal conditions of transport and hypothetical accident condition tests.

Requirements of 10 CFR Part 71.43 (General standards for all packages) specify a package must be designed, constructed, and prepared for shipment so that under the tests specified in § 71.71 (Normal conditions of transport) there would be no loss or dispersal of radioactive contents, no significant increase in external surface radiation levels, and no substantial reduction in the effectiveness of the packaging.

Improper securing of seven of the fifty-eight closure bolts, as occurred for this event, did not significantly reduce the effectiveness of the packaging in preventing damage incident to accident conditions of transport. Though loose, all of the bolts and nuts were in place.

The package would be subcritical for normal transport conditions and hypothetical accident conditions with the seven loose closure bolts. This event did not alter assumptions about the geometric form of the fuel assemblies, spacing between fuel assemblies with the packaging, and spacing between the fuel assemblies and outer surface of the packaging that are assumed in the evaluation of the package.

(4) Corrective Actions

(i) Remedial Actions

Packing operators checked other Model 927 containers as they were packed. Closure bolts were fastened by applying the 30-35 foot-pounds torque specified in the operating procedure and found that many of the spacers would spin, but the bolts were tight. (February 12 - 14, 2007)

(ii) Interim Actions

Container C5827 was removed from service.

(iii) Corrective Actions to Prevent Recurrence

An Apparent Cause Analysis has been performed. (ACA 07-037-C003). As part of the investigation an engineering evaluation was made of the effect of that applied load on the flange and closure bolt has on performance during routine transport conditions.

The container removed from service (C5827), a recently refurbished Model 927 package (C5943) and another container randomly selected from packagings in use were tested. A test was conducted to determine the effect of stacking a single the loaded 927 as done for routine shipping. The Westinghouse operating procedure allows 30-35 foot-pounds (360-420 inch –pounds) and a mid range torque of 33 foot-pounds (396 inch-pounds) was applied to the cover bolts. There were 11 loose spacers, and no loose nuts or T-bolts after torque sequence and prior to stacking the packages. After stacking the packages, there were 30 loose spacers, 2 loose T-bolts and 2 loose nuts. Loose means movable by hand, but still attached to the bolt shank.

The test was repeated with the torque applied to the cover fasteners increased to 50 foot-pounds (600 lb-in). This torque value ensures the stress on the bolt is less than the yield strength, 0.2 % offset of 50 ksi for a ½ inch diameter ASTM A193 Grade B7 bolt . Prior to stacking packages there were 4 loose spacers, but no loose nuts or T-bolts. After stacking the packages, there was no change. The nuts were easily removed with approximately a half-turn by a hand wrench and there was no evidence of galling or binding of the nuts,

The Westinghouse operating procedure, MOP-730313, Packing Model 927 Shipping Packaging, was revised to increase the torque for the cover fasteners from 30-35 foot-pounds (360-420 inch-pounds) to 47.5 to 52.5 foot-pounds (570-630 inch-pounds). In addition, a Nuclear Fuel, F Specification, F-4C, for handling Model 927 packages at customer sites will be revised to increase the torque for cover fasteners.

(5)Previous similar events involving the same packaging

Incidents involving loose closure bolts are documented for two other shipments that were made in 2002 and 2003 using the Model 927 package. The instance in 2002 was a single bolt that was hand tight when received by the customer site. During fuel receipt at a customer site in 2003 it was noted that the closure bolts were only hand tight and two closure bolts were completely loose.

(6) Contact Information

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(7) Exposure of individuals to radiation or radioactive materials

This event did not result in exposure of individuals to radiation or radioactive material other than allowed for routine transport of radioactive materials in a Type A fissile material package.

Event description for 927A1/927C1 (USA/6078/AF)
Failure of label to contain the transport index (Revised)

(1) Summary of event

The Radioactive Yellow-II label affixed to six packages failed to contain a value for the transport index.

(2) Description of Event

(i) Event Chronology

On January 31, 2007, a fresh fuel shipment was made to a customer. During fuel receipt on February 2, 2007, the customer reported from the site that the Transport Index (TI) numbers were missing from the radioactive labels on the packages. Container serial numbers C5969,C5962, C5956, C5895, C5879, and C5840 were missing TI on Yellow II labels.

(ii) Process Description

U.S. DOT regulations (49 CFR Part 172, Subpart E-Labeling) require a Radioactive Yellow-II label with the transport index as defined in 49 CFR 173.403 on the label. The transport index designates the maximum radiation level in millirem per hour at 1 m (3.3 feet). A transport index of not more than 10 is allowed for Radioactive Yellow-II label. Transport index determined by direct measurement and documented on the shipping papers for the packages was 0.3.

(iii) Causal Factors

Operator failed to follow procedure that requires recording TI on Radioactive Yellow-II label.

(3) Safety Consequences and Implications of the Event

In addition to identifying the radioactive properties of the contents, the labels also carry more specific information regarding the contents, i.e. the name of the nuclide, or the most restrictive nuclides in the case of a mixture of radionuclides, and the activity. In the case of fissile contents, the mass of fissile material may be substituted for the activity. This information is important in the event of an incident or accident where content information may be needed to evaluate the hazard. Yellow labels also show the TI of the cargo unit (i.e. package, overpack, tank and freight container). The TI information is essential in terms of storage and stowage in that it is used to control the accumulation and assure proper separation of cargo units. The Regulations prescribe limits on the total sum of TIs in such groups of cargo units.

(4) Corrective Actions

(i) Remedial Actions
Peer checking initiated to ensure labels are properly completed.

(ii) Interim Actions
Requirements for proper labeling of radioactive material packages reviewed with transportation HAZMAT employees responsible for fuel shipment preparation. The review emphasized the US DOT requirement for inclusion of transport index information on labels and shipping papers for shipments requiring radioactive II and III labels.

(iii) Corrective Actions to Prevent Recurrence
Radioactive material vehicle dispatch checklist, CF-85-002, was revised to to include reminder to check for the TI on the radioactive material label. The checklist is used to document an independent verification by a transportation HAZMAT employee that the shipping papers, markings. labels, tamper seals, vehicle condition, tie-downs, placards, comply with the US DOT transportation regulations.

(5)Previous similar events involving the same packaging

No events have been previously reported involving labels for radioactive material packaging that are known to Westinghouse Electric Company.

(6) Contact Information

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(7) Exposure of individuals to radiation or radioactive materials

This event did not result in exposure of individuals to radiation or radioactive material other than allowed for routine transport of radioactive materials in a Type A fissile material package.