

March 16, 2017

U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, MD 20852-2738

Attn: Document Control Desk

Subject: Request for a Revision to Certificate of Compliance (CoC) No. 9235 for the NAC-STC Cask Gamma Scanning Requirements

Docket No. 71-9235

- References:
1. Model No. NAC-STC Package, U.S. Nuclear Regulatory Commission (NRC) Certificate of Compliance (CoC) No. 9235, Revision 15, December 20, 2016
 2. Safety Analysis Report (SAR) for the NAC Storage Transport Cask (NAC-STC), Revision 17, NAC International, April 2011
 3. NUREG-1617, Standard Review Plan for Transportation Packages for Spent Nuclear Fuel, March 2000
 4. NUREG/CR-3854, Fabrication Criteria for Shipping Containers, March 1985

NAC, herewith, is requesting a revision to the NAC-STC SAR (Reference 2) Chapter 8, Section 8.1.5.1 "Gamma Shield Test". Specifically, Section 8.1.5.1 currently describes gamma scanning the cask body after the lead pour to include all accessible cask surfaces, including the cask closure lids and the cask bottom inner forging and outer plate. This requirement to scan components that do not incorporate lead shielding is inconsistent with the mockup test which is used for calibration prior to performing the gamma scan of the cask body. In other words, this mockup is equivalent to the steel-lead-steel configuration of the cask body and not the cask closure lids or cask bottom forging and plate as there is no lead in those components. The intent of NAC's use of the gamma scanning test is to verify the cask body lead pour was successfully completed in accordance with its design requirements and demonstrates its soundness as gamma shielding. With no lead content, NAC believes that the gamma shielding effectiveness of the cask closure lids and cask bottom forging and plate is best determined by a demonstration method other than gamma scanning.

Considering the foregoing, it is NAC's position that the cask closure lids and cask bottom forging and plate are outside the scope of the gamma scanning test presented in Reference 2, Section 8.1.5.1. Further justification of their removal from the gamma scanning test is that they will meet one of the gamma shielding acceptance testing methods described in NUREG/CR-3854 (Reference 4). In NUREG-1617 (Reference 3), the reviewer is referred to NUREG/CR-3854 (Reference 4) for additional guidance on fabrication acceptance tests. Section 3.2.1 of Reference 4 provides two acceptable demonstration methods. One is gamma scanning and the other is ultrasonic testing. Since the cask inner closure lid and cask inner bottom forging are part of the containment boundary, they are already ASME Section III, Division I, Subsection NB components which are ultrasonic tested (UT) as part of procurement prior to final installation and are therefore, acceptable gamma shields per Reference 4 without the need for being subjected to an additional gamma scan examination. Since the cask outer closure lid and cask outer bottom plate are not part of the containment boundary, they are not required to be UT.

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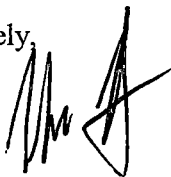
However, NAC is revising the SAR to require the cask outer closure lid and cask outer bottom plate to also be subjected to UT to demonstrate their soundness as gamma shielding.

In summary, the NAC-STC transportation cask will demonstrate its soundness as gamma shielding by being tested as follows:

1. The cask body (i.e., inner shell and outer shell) containing lead shielding will be gamma scanned following the lead pour to demonstrate its soundness as gamma shielding. An equivalent mockup of the applicable cask body components will be made for calibration of equipment used to perform the gamma scanning.
2. The cask inner closure lid and cask inner bottom forging (i.e., containment boundary components other than the cask body inner shell) are procured as ASME Section III, Division I, Subsection NB components are therefore, UT as part of procurement prior to final installation.
3. Even though the cask outer closure lid and cask outer bottom plate are not part of the containment boundary, they will be UT to demonstrate their gamma shielding effectiveness.

The above three actions demonstrate the soundness of the cask at providing adequate gamma shielding. This submittal package includes one hard copy version of this package, which includes the Revision 17A changed pages (Enclosure 2) to the Reference 2 SAR pages. Enclosure 1 contains a brief summary of the changes to the SAR for Revision STC-17A. Consistent with NAC administrative practice, this proposed SAR revision is numbered to uniquely identify the applicable changed pages. Revision bars mark the SAR text changes on the Revision STC-17A pages. In accordance with NAC's administrative practices, upon final acceptance of this application, the STC-17A changed pages will be reformatted and incorporated into the next revision of the NAC-STC SAR. If you have any comments or questions, please contact me on my direct line at 678-328-1236.

Sincerely,



Wren Fowler
Director, Licensing
Engineering

Enclosure 1 – List of Changes, NAC-STC SAR, Revision 17A
Enclosure 2 – SAR Page Changes and LOEP, NAC-STC SAR, Revision 17A

March 2017

Revision 17A

NAC-STC

NAC Storage Transport Cask

SAFETY ANALYSIS REPORT

Gamma Scanning Test Requirements Revision

Docket No. 71-9235



Enclosure 1

List of Changes

NAC-STC SAR, Revision 17A

March 2017

List of Changes, NAC-STC SAR, Revision 17A

Chapter 1

- No changes.

Chapter 2

- No changes.

Chapter 3

- No changes.

Chapter 4

- No changes.

Chapter 5

- No changes.

Chapter 6

- No changes.

Chapter 7

- No changes.

Chapter 8

- Page 8.1-11, revised first sentence of Section 8.1.5.1 to specify the accessible cask body surfaces are regions that directly shield the lead that was poured; next to last sentence in first paragraph, the parenthetical statement is revised to say “cask body exterior shell surfaces”; last sentence in first paragraph, which was referring to gamma scanning flat surfaces, is deleted; a new second paragraph is added specifying an ultrasonic test is required and not a gamma scan test for the stated flat surfaces; the third paragraph is revised to specify the criteria is for the cask body; it was also revised to remove the lid reference; in addition, the first line of the third paragraph is revised by replacing “will” with “shall”

Chapter 9

- No changes.

Enclosure 2

SAR Page Changes and LOEP

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8.1.5 Tests for Shielding Integrity

8.1.5.1 Gamma Shield Test

The gamma scan test shall be conducted by continuous scanning or probing over 100 percent of all accessible cask body surfaces, which directly shield regions where lead was poured, using a 3-inch detector and a ^{60}Co source. The source strength shall be of an intensity sufficient to produce a count rate that equals or exceeds three times the background count rate on the external surfaces of the cask. The count rate shall be maintained for greater than one minute prior to the start of scanning. The detector scan path spacing (cask body exterior shell surface) will be a maximum of 2.5 inches and the scanning speed will be 4.5 feet per minute or less. The source scan path spacing (cask interior surface) will be on a 2-inch grid pattern (when using a 3-inch detector).

A gamma scan test is not required for the cask inner closure lid, cask outer closure lid, cask inner bottom forging, or cask outer bottom plate. These components shall be ultrasonic tested in order to demonstrate their soundness as gamma shielding.

The acceptance criteria for the cask body shield test shall be that the shield effectiveness of the cask body is equal to or greater than the shield effectiveness of a lead and steel mock-up. The steel thickness of the mockup shall be equivalent to the minimum steel thickness specified on the License Drawings and the lead thickness shall be equivalent to the minimum lead thickness specified in the License Drawings less 3 percent. The shielding mock-up will be produced using the same fabrication techniques as those approved for the cask.

Measured count rates that exceed those established by the test mock-up shall cause the component to be rejected. The rejected areas/components shall be evaluated to determine the corrective action to be taken. Any repaired areas shall be retested prior to acceptance.

An additional gamma shield effectiveness test shall be performed on each cask following first fuel loading. The neutron and gamma shield effectiveness test procedures and acceptance criteria are described in Section 8.1.5.4.

8.1.5.2 Neutron Shielding Test

The neutron shielding of the NAC-STC is provided by a solid layer of NS-4-FR, which is a hard polymer material. A 5.5-inch layer of NS-4-FR is located in the annulus formed by the outer shell and the 0.236-inch (6 mm) thick neutron shield shell. The neutron shield is divided in sections by the copper/stainless steel fins. A 2-inch thick layer of NS-4-FR is also installed in the cask inner lid and in the cask bottom.

The installation of NS-4-FR material in the fabrication of the cask is a special process and, as such, procedures will be prepared and qualified to ensure that the mix ratios, mixing method, degassing, pouring, and curing of the material is properly performed. The NS-4-FR raw material is provided in the form of a 3-part mixing kit. The material content of the raw material is tested and certified at the time of kit preparation. The neutron shielding material is installed into the annulus between the outer shell and the neutron shield shell by pouring it with the cask in an inverted vertical position. Prior to installation, samples from each mix of the actual material being poured into the annulus are wet density tested to ensure that the material is properly mixed. Mixes that do not meet the wet density acceptance criteria are rejected. Procedures used for installation of the material are validated prior to use by destructive examination of a full scale mock-up of the neutron shield cavity. Qualification of the installation procedure verifies material homogeneous properties and minimizes the potential deleterious voids.

8.1.5.3 Neutron Shielding Material Testing

The neutron shield properties of NS-4-FR are provided in Chapters 1 and 3. Each lot (mixed batch) of neutron shield material shall be tested to verify that the material composition (aluminum and hydrogen), boron concentration, and neutron shield density meet the requirements specified in Chapters 1 and 3 and the License Drawings. Testing shall be performed by qualified laboratories in accordance with written and approved procedures. Material composition, boron concentration, and density data for each lot of neutron shield material shall become part of the quality record documentation package.

Dimensional inspection of the cavities containing the neutron shielding material shall ensure that the required thickness specified in the License Drawings is incorporated into the cask.

The installation of the neutron shielding material shall be performed in accordance with written, approved, and qualified procedures. The procedures shall ensure that mix ratios and mixing methods are controlled in order to achieve proper material composition, boron concentration and distribution, and that pours are controlled in order to prevent gaps or unacceptable voids from occurring in the material. Procedures shall be qualified by the use of mock-ups to ensure that the NS-4-FR installation does not result in the creation of unacceptable voids. Samples of each lot of neutron shield material shall be maintained as part of the quality record documentation package.