REQUEST FOR ADDITIONAL INFORMATION
NAC INTERNATIONAL
DOCKET NO. 72-1031
AMENDMENT NO. 1

By letter dated March 26, 2009, (Agencywide Documents Access and Management System Accession No. ML090890292) NAC International submitted an application seeking Nuclear Regulatory Commission (NRC) approval of a proposed amendment to Certificate of Compliance No. 1031 for the NAC International MAGNASTOR® cask system, to define and clarify requirements for qualification and testing of BORAL neutron absorber material.

This request for additional information (RAI) identifies information needed by the U.S. Nuclear Regulatory Commission (NRC) staff in connection with its review of the amendment. Applicable regulatory requirements are specified in the individual question or comment.

The staff's technical review was carried out in accordance with the applicable NRC regulations in 10 CFR Parts 20 and 72, and the NRC guidance contained in NUREG–1536, "Standard Review Plan for Dry Cask Storage Systems (NRC, 1997)." Note that RAI items may refer to the Division of Spent Fuel Storage and Transportation's (SFST) Interim Staff Guidance (SFST-ISG). The ISGs were developed as a result of management decisions on several key issues related to the review and approval of spent fuel storage systems and represents positions discussed in meetings with the Nuclear Energy Institute. The current ISGs will be incorporated into the next revision of NUREG-1536.

The staff notes that draft ISG-23, "Application of ASTM Standard Practice C1671-07 When Performing Technical Reviews of Spent Fuel Storage and Transportation Packaging Licensing Actions," states the acceptability of thermal neutron beam sizes of up to 2.54 cm in diameter, with a 10-percent tolerance, for performing qualification and acceptance testing of neutron absorbing materials [*Federal Register*, Volume 74, page 31769]. While the staff is not asking any questions in this RAI to address the thermal neutron beam size, this information may be useful in case the applicant desires any further flexibility.

The following questions are related to the Technical Specifications (TS).

1. The credit taken for the efficacy of Boral neutron absorbers (75%) should be explicitly stated in the TS. Provide a revised, proposed TS including this information.

   The safety analysis report states the percentage credit given to the efficacy of Boral neutron absorbers for the control of k_{eff}, but that percentage is not stated in the TS.

   This information is needed to determine compliance with 10 CFR 72.124(a).

Enclosure

2. Provide proposed language for the TS to specify the grade of boron carbide powder (e.g. ASTM C 750 – 03) used in the neutron absorbing materials.

   A nuclear grade of boron carbide powder should be used in applications requiring boron carbide for criticality control, to ensure the quality and the uniformity of properties of the boron carbide powder.

   This information is needed to determine compliance with 10 CFR 72.124(a).

3. Develop and provide language for the TS, specifying qualifying mechanical test(s) for the neutron absorbing materials.

   The neutron absorbing materials must demonstrate a minimum level of mechanical integrity to ensure proper operation during a hypothetical accident. Mechanical testing is therefore necessary to verify the durability of the neutron absorber materials and can not be substituted by dimensional measurements or "certified quality-controlled test results," unless such results are explained to the staff's satisfaction.

   Furthermore, the mechanical integrity of laminated neutron absorbing materials is determined not only by the mechanical properties of the aluminum cladding, but also by the bond between the cladding and porous boron carbide/aluminum core. The yield strength of a composite material can only be determined by mechanical testing of the composite, and can not be determined solely on the yield strength of the cladding.

   Qualitative tests (e.g. ASTM E 290 – 97) demonstrating the mechanical durability of neutron absorbing materials may be acceptable to staff, if the applicant can provide a technical justification, and appropriate acceptance criteria.

   This information is needed to determine compliance with 10 CFR 72.124(a).

4. Develop and provide language for the TS to specify the maximum boron or boron carbide content (volume or weight percent) of the neutron absorbing materials to which such materials can be qualified.

   The boron or boron carbide content of the neutron absorbing materials heavily affects the mechanical, thermal, and physical properties of neutron absorbing materials. The applicant should denote the maximum boron or boron carbide content for each individual neutron absorbing material. Conventional fabrication methods of borated aluminum alloys and particle-reinforced metal matrix composites limit the amount of boron and boron carbide that can be incorporated into an aluminum matrix.

   The applicant is encouraged to look at other applications which have been recently approved by the staff to determine what volume or weight percent limits that staff has permitted in such materials.

   This information is needed to determine compliance with 10 CFR 72.124(a).

5. Provide proposed language for the TS to specify the maximum total and open porosity of the neutron absorbing materials, and qualifying tests, to measure the total and open porosity.

   Porosity, particularly open porosity, influences the corrosion behavior of the neutron absorbing materials.

   This information is needed to determine compliance with 10 CFR 72.124(a).

The following questions are related to the Safety Analysis Report (SAR).

6. In SAR section 10.1.6.4.5, clarify the definition of a “lot” when referring to the number of neutron absorbing panels produced.

   The application does not define a “lot” of neutron absorbing material.

   This information is needed to determine compliance with 10 CFR 72.124(a).

7. Justify the use of homogeneous calibration standards, discussed in SAR section 10.1.6.4.5, for calibrating neutron attenuation measurements of neutron absorbing materials. Alternatively, specify that the heterogeneous calibration standards, which are used for neutron attenuation measurements, have been independently calibrated from a widely recognized source.

   The staff is concerned that the use of heterogeneous or secondary calibration standards could result in inaccurate measurements of ^{10}B areal density in neutron absorbing materials.

   This information is needed to determine compliance with 10 CFR 72.124(a).

8. Justify and describe the methodology by which the ^{10}B areal density is determined using radiography. Alternatively, remove radiography as a method used to measure ^{10}B areal density from the application.

   SAR section 10.1.6.4.5 refers to using radiography as a method for determining the ^{10}B areal density. The staff does not believe radiography has ever been used by any applicant to quantify the areal density of ^{10}B in a material.

   This information is needed to determine compliance with 10 CFR 72.124(a).

9. Clarify the second bullet in SAR section 10.1.6.4.5.

   The second bullet in SAR section 10.1.6.4.5 appears to allow complete substitution of neutron attenuation acceptance tests by wet chemistry methods for all types of neutron absorbing materials.

   For 90% credit of the neutron absorber towards k_{eff}, partial substitution of neutron attenuation acceptance tests by wet chemistry methods is acceptable if the supplier of neutron absorbing materials has conducted a sufficient number of qualifying neutron attenuation tests, and the wet chemistry methods have been benchmarked against neutron attenuation results.

For 75% credit of the neutron absorber towards k_{eff}, neutron attenuation acceptance tests may be completely substituted by wet chemistry methods if the wet chemistry methods have been benchmarked against neutron attenuation results.

This information is needed to determine compliance with 10 CFR 72.124(a).

10. In SAR section 10.1.6.4.6, remove the word “may” from the sentence: “Typical changes covered by the agreed-upon process controls may include.”

    The changes listed should be considered significant changes.

    This information is needed to determine compliance with 10 CFR 72.124(a).

11. In SAR section 10.1.6.4.6, clarify the term “minor neutron absorber material processing changes," and distinguish these minor changes from major changes in key manufacturing processes.

    SAR section 10.1.6.4.6 does not clearly distinguish a minor processing change from a major processing change.

    This information is needed to determine compliance with 10 CFR 72.124(a).

12. Clarify how physical property measurement, described in the first paragraph of SAR section 10.1.6.4.8, is used to verify the constituents of the neutron absorber.

    Solid materials have a wide range of physical properties. It is unclear what properties are being used to verify the constituents of the neutron absorber material.

    This information is needed to determine compliance with 10 CFR 72.124(a).