

Structural

- 1) Clarify material properties presented. NRC requested "similitude (plot) between input and actual material properties for the FE analyses". The applicant did not address this request. It is not clear whether the behavior presented in Figures 6 and 7 of the translation of B-TA-3991-Rev.2 are of actual wood tests or of analysis input.
- 2) Provide description of each material model used in the analyses. Applicant provided the material cards as used on the program; however, no description of the material models were provided as requested. It is also not clear to which analysis each card belongs. NRC is specifically requesting the material model name used in the program for each card, description of the material model, as well as what each parameter in each card signifies, and what feature of the package each card models (in English). If information is provided by reference, copy of the reference is requested.
- 3) Provide output for trunnion analyses. NRC requested input and output files for FE analyses, only input files were provided.
- 4) Provide drawings with English descriptions for all text within the drawings. To perform review staff needs appropriately translated drawings. There are more than 50 pertinent drawings in the application.

Materials (If there is no response in red then no information was provided):

- 1- What are "DWR" and "SWR" fuel rods? **Done**
- 2- States that the packaging is made of stainless steel but does not specify the type or grade. The type and grade of all structural materials and cladding materials must be specified in "English" notation

See Ulrich Kettner, 03-09-2009 memo, section 1.2 , "Specification of structural materials in English notation" for cross-reference list.

- 3- The application mentions "canned" fuels but gives no description of the cans

Per memo, section 1.3, "The cans for the fuel are specified in the drawings 2-190-108-00-01 and 2-190-112-00- 01 enclosed in the set of drawings in attachment 3.1 of the SAR.

- 4- On some of the translated drawings, the specifications, where given, are in foreign notation, ie EN 10058, material # 1.4429, or 2CrNiMoN for example. See # 2 above. **I may be able to answer this one by tracing through the information in the last submittal**

See Ulrich Kettner, 03-09-2009 memo, section 1.2 , "Specification of structural materials in English notation" for cross-reference list. (e.g. 1.4429 = UNS S31653)

- 5- A number of references for materials properties that are not available to the reviewer. Either specify an English reference or supply the pages from the translated reference document. DIN EN 10088-2 and other DIN references, GURUSWANY 2000, AK Steel 2002 for example. **May be able to get some partial info from the current response to answer this but I am not sure without a detailed look.**

See Ulrich Kettner, 03-09-2009 memo, section 1.5:

1.5.1 AKSTEEL

A subsidiary of former Armco Inc., Middleton, Ohio, now merged with AKSTEEL
Deliverer of Nitronic 50 and 50HS bars, UNS S20910 and Nitronic 60 bars, UNS S21800

See Attachment 1: Specification of Nitronic 50 and 50HS

See Attachment 2: Specification of Nitronic 60

1.5.2 GURUSWAMY

"Engineering Properties and Applications of Lead Alloys", Sivaraman Guruswamy,
University of Utah, Salt Lake City, Utah; ISBN 0-8247-8247-X

Page 59 Table 6 Listing of Lead Alloys as per the Unified Numbering System

Page 98 Table 21 Thermal Properties of Lead Alloys

Page 124 Table 24 Mechanical Properties of Lead Alloys

Page 132 Table 25 Mechanical Properties of Commonly Used Lead Alloys

Page 163 Figure 59 Creep-to-rupture Diagram of Lead and Lead Alloys

Diagrams see Attachment 3

1.5.3 NIEMZ

"Physics of Wood and Wooden Materials"; ISBN 3-87181-324-9

Text and Diagrams see Attachment 4

1.5.4 GGR009

Federal Agency for Material Research and Testing

"Guideline for Calculating Lid Systems and Load Attachment Systems for Radioactive
Material Transport Casks", 8th Draft, March 2006

See Attachment 5

1.5.5 Steel Standards

See Attachment 6

- 6- In Sec 4.3.11 (thermal design) to 4.3.13 (shielding design) states that there is no change in properties or configuration but never indicates where the analysis supporting this statement can be found. Similarly for Sec 4.4.11 to 4.4.13

1.6 Scope of proof in sections 4.3.1, 4.4.1 and 4.5.1

In these sections the scope of proof with respect to other chapters of the SAR is specified. Generally, these sections 4.3.1 to 4.5.1 are the extract of the summary of the results of the analyses in the respective chapters 4.3 to 4.5 with respect to the required input data for the chapters in the SAR.

E. g., section 4.3.1.1 specifies as scope of the mechanical analysis with respect to thermal design that no change of properties and shape of the package occurs during routine conditions of transport which might affect the thermal design. Subsequently, in section 4.3.2 the safe design of the trunnions is proofed, it is proofed that the packaging body is not deformed by routine conditions of transport and the design of the interior components is analysed. These analyses together result in the summarized statement of section 4.3.1.1.

E. g., section 4.5.1.1 specifies a deformation of 60% of the shock absorbers after drop tests in axial directions, which is proofed in section 4.5.2.3, 4.5.2.4 and compared with drop test results in section 4.5.2.9 validating the theoretical analysis in the foresaid chapters.

- 7- Balsa wood impact limiters are used and properties are given but there is no reference for these properties **Done**
- 8- What do the symbols $P_{P0.2}$, $R_{P1.0}$, and R_M in MPa mean? Are they related to the yield, and ultimate strength?

R_{PO}: Yield strength with 0.2% residual strain
R_{PI}: Yield strength with 1.0% residual strain (for austenitic steels)
R_m: Tensile strength

9- Axes on all figures need to be translated.

See Ulrich Kettner, 03-09-2009 memo, section 1.9, "Parameter on Axis of Diagrams"

10- Attachments must be in English so we can check the materials properties used. For example Attachment 4.4 Bolt calculations is currently in German

This information is needed to ensure compliance with Section VIII, Approval and Administrative Requirements, Regulation 807(b) of the IAEA Safety Standard Series, "The Regulations for the Safe Transport of Radioactive Material 1996 Edition (As Amended 2003), (TS-R-1).