

**Spent Fuel Project Office
Interim Staff Guidance - 18**

Issue: **The Design/Qualification of Final Closure Welds on Austenitic Stainless Steel Canisters as Confinement Boundary for Spent Fuel Storage and Containment Boundary for Spent Fuel Transportation**

Introduction:

The purposes of this ISG are to address the qualification of the final closure welds of austenitic stainless steel canisters:

- (1) As an adequate confinement boundary under 10 CFR Part 72 (Ref. 1) for purposes of demonstrating no credible leakage during storage and satisfying the dose limits in 10 CFR Parts 72.104(a) and 72.106(b); and
- (2) As an adequate containment boundary under 10 CFR Part 71 (Ref. 2) for purposes of demonstrating no credible leakage during transportation and satisfying the release limits in 10 CFR Part 71.51.

Discussion:

When the final closure welds of austenitic stainless steel canisters are executed in accordance with ISG-15, the staff concludes that no undetected flaws of significant size will exist. Weld failures resulting from flaws in these welds are rare and are usually caused by improper fabrication techniques resulting in flaws that are detectable immediately after welding. The welding and examination techniques described by ISG-15 will detect any such flaws which could lead to a failure.

Therefore, the staff believes that there is reasonable assurance that no credible leakage would occur from the final closure welds of austenitic stainless steel canisters

Regulatory Basis:

Storage

The systems, structures, and components (SSCs) important to safety must be designed, fabricated, erected, and tested to quality standards commensurate with the importance to safety of the function to be performed. [10 CFR 72.122(a)].

The spent fuel storage cask and its systems important to safety must be evaluated, by appropriate tests or by other means acceptable to the NRC, to demonstrate that they will reasonably maintain confinement of radioactive material under normal, off-normal, and credible accident conditions. [10 CFR 72.236(l)]

The independent spent fuel storage installation must be designed to provide conformance to Parts 72.104 and -106 effluents and direct radiation limits.

Transportation

A Type B package must be designed, constructed and prepared for shipment so that . . . there would be no loss or dispersal of radioactive contents - as demonstrated to a sensitivity of 10^{-6} A2 per hour. . . . [10 CFR 71.51(a)].

Before the first use of any packaging for the shipment of licensed material, the licensee shall ascertain that there are no cracks, pinholes, uncontrolled voids, or other defects that could significantly reduce the effectiveness of the packaging. [10 CFR 71.85 (a)].

Technical Review Guidance:

The staff has concluded that welded inner canisters can be used as a confinement or containment system, as described above, provided that the following guidance is met.

Design/Qualification Guidance for Storage:

1. The canister is constructed from austenitic stainless steel.
2. The canister closure welds meet the guidance of ISG-15 (or approved alternative), Section X.5.2.3 "Weld Design and Specifications," (Ref. 3).
3. The canister maintains its confinement integrity during normal conditions, anticipated occurrences, and credible accidents and natural phenomena, as required in 10 CFR Part 72.
4. Records documenting the fabrication and closure welding of canisters shall comply with the provisions of 10 CFR Part 72.174, "Quality Assurance Records" and ISG-15. Records storage should comply with ANSI N45.2.9, "Requirements for Collection, Storage, and Maintenance of Quality Assurance Records for Nuclear Power Plants."
5. Activities related to inspection, evaluation, documentation of fabrication, and closure welding of canisters shall be performed in accordance with a NRC-approved quality assurance program as required in 10 CFR Part 72, Subpart G, "Quality Assurance."

Design/Qualification Guidance for Transportation:

1. The canister is constructed from austenitic stainless steel.
2. The canister closure welds meet the guidance of ISG-15 (or approved alternative), Section X.5.2.3 "Weld Design and Specifications."

3. The canister (i.e. containment boundary) is demonstrated to maintain its integrity during normal conditions of transport and hypothetical accident conditions as required in 10 CFR Part 71. This demonstration of integrity may be performed with a rigorous analysis of the canister and all welded connections that are part of the containment boundary in accordance with ASME Boiler & Pressure Vessel Code Section III, Division 3, Subsection WB. The analysis shall include the canister interaction with the transportation overpack.
4. The undamaged canister is demonstrated to satisfy the requirements of 10 CFR 71.61 for external water pressure.
5. Records documenting the fabrication and closure welding of canisters shall comply with the provisions of 10 CFR Part 71.135, "Quality Assurance Records" and ISG-15. Records storage should comply with ANSI N45.2.9, "Requirements for Collection, Storage, and Maintenance of Quality Assurance Records for Nuclear Power Plants."
6. Activities related to inspection, evaluation, documentation of fabrication, and closure welding of canisters shall be performed in accordance with a NRC-approved quality assurance program as required in 10 CFR Part 71, Subpart H, "Quality Assurance."
7. The external surface of the canister can be demonstrated to satisfy the requirements of 10 CFR 71.87(i) for non-fixed radioactive contamination.
8. The welded canister (i.e., the containment boundary) must be leak tested in accordance with ANSI N14.5-1997, except for the final closure welds.

Leak-Testing Requirements

The qualification standards discussed above provide a sufficient alternative to the fabrication, periodic, and pre-shipment leak-testing requirements of ANSI N14.5 for the final closure welds.

Applicability:

This guidance applies to dry cask storage system reviews conducted in accordance with NUREG-1536, "Standard Review Plan for Dry Cask Storage Systems" (January 1997); NUREG-1567, "Standard Review Plan for Spent Fuel Storage Facilities" (March 2000); and transportation packages for spent nuclear fuel in accordance with NUREG-1617, "Standard Review Plan for Transportation Packages for Spent Nuclear Fuel" (March 2000).

Recommendation:

The staff recommends that the appropriate chapters of NUREG-1536, NUREG-1567 and NUREG-1617 be revised to incorporate the above guidance related to the final closure welds of austenitic stainless steel canisters.

References

1. U.S. Code of Federal Regulations, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater Than Class C Waste," Title 10, Part 72, January 1, 2003.
2. U.S. Code of Federal Regulations, "Packaging and Transportation of Radioactive Material," Title 10, Part 71, January 1, 2003.
3. Interim Staff Guidance - 15, "Materials Evaluation," January 2001.

Approved _____ /RA/ _____ May 2, 2003
E. William Brach _____ Date