Safety Evaluation Report for Certificate of Compliance No. 9516 Amendment for the Model 9516 Package

Docket No. 24-32-9516

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This Safety Evaluation Report (SER) documents the U.S. Department of Energy (DOE) Packaging Certification Program (PCP) independent technical review of the application and supplement submitted for the DOE Idaho Operations Office (ID) for amendment of DOE Certificate of Compliance (CoC) Number 9516 for the Model 9516 package design. This package is needed to support the mission of the Idaho National Laboratory (INL), Space Nuclear Power & Isotope Technologies Division.

Evaluation

By email [1] dated June 21, 2024, DOE-ID submitted an application [2] and technical justification [3] to the DOE PCP, requesting an amendment to DOE CoC No. 9516 Revision 12, to authorize non-safety related changes to CoC Drawing 756179 (11 sheets), Revision 5, for fabrication of new packaging.

The purpose of these changes is to simplify and clarify the manufacturing process and requirements. The applicant demonstrated compliance with 10 CFR Part 71 by comparison of these changes to the package design approved in CoC 9516 Rev 12.

The applicant revised sheets 1 and 4 through 9 of the drawing to incorporate eight changes. The table below describes the changes, the applicant's justification for the changes, and DOE PCP staff's review of the changes.

Description of the Proposed Change to Drawing 756179, Rev 5	Applicant's Justification in ECAR-7969, Rev 0	DOE PCP Staff Review & Evaluation
1. **Sheet 1 Note 7 and Sheet 9 Notes 2, 5, and 6:** Deleted reference to the specific 1989 and 2004 editions of ASME Boiler and Pressure Vessel Codes Section VIII Division 1 and Section IX for weld qualifications and inspections for the Cask.	Weld qualifications and examinations are typically certified to the latest standards to ensure the requirements remain up to date with the current knowledge of materials, techniques, and capabilities. Certifications and qualifications typically reference the current code edition thus allowing the certification/qualifications to be used across multiple projects and programs. A review was performed to evaluate the Code changes between the 2004 and 2023 (latest) editions that would affect weld qualifications and inspections. Specifically, the review was limited to GTAW and FCAW welding processes and liquid penetrant and visual	DOE PCP staff concurs this change is consistent with CoC Rev 12, Section 5(a)(2), page 2, 4th paragraph with respect to requiring new construction (of the cask) in accordance with latest revision of ASME BPVC, Section VIII, Division 1, using the latest ASME material specifications, and to perform a reconciliation analysis for each material type to ensure the original 2004 ASME Code requirements are met or exceeded in the 2023 edition.

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	inspections. A tabulation of the review can be found in Appendices A and B (of the ECAR). The only significant change was the allowance to use ultrasonic testing instead of radiography as an alternate to performing mechanical testing for weld qualifications. This change was made in the 2010 issue of Section IX. The main difference between radiography and UT is that radiography can detect smaller round voids and inclusions than UT while UT is better at detecting some defects, particularly with GMAW-S (American Welding Society, Welding Journal, August 2010, Walter J. Sperko, P.E.). Since the ASME BPVC Section IX committee has considered UT to be an acceptable practice for weld qualification since 2010, INL will support this decision for the application on the 9516 shipping casks. Allowing current editions of the code will ensure compliance methodology remains up to date with industry expectations. This change does not affect the design of the 9516 package.	
2. **Sheet 4 Weld Detail 4:** Corrected weld requirements by adding a fillet weld to the outside joint of the lower angle iron and the cross members.	Existing personnel barriers were found to have a weld at this location. This correction adds an existing expectation to the drawing and does not change the design of the 9516 package.	This weld is included on the current as-built personnel shields (cask frames) but was omitted from the drawing detail. Staff concurs with this correction to the drawing detail.
3. **Sheet 5 Zone C-6:** Added a "Flag Note" to the weld symbol.	The Flag Note, also shown on Sheet 5 Zone D6, allows the weld to be performed "in the field," i.e. after the lower mesh guard is attached to the	This detail was omitted from Zone C-6 and the proposed change is consistent with the "flag" in Zone D-6. Staff

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	personnel barrier. This change does not affect the design of the 9516 package.	concurs with this correction to the drawing detail.
4. **Sheet 5 Zone D-6:** Corrected the number of welds from 4x to 2x. The weld symbol applies to both the near and far sides of flat bar Item 2C. Since there are only two Item 2C, the weld symbol would only be applicable twice, i.e., 2x.	This corrects a typographical error and does not affect the design of the 9516 package.	Staff concurs with this correction to the drawing detail for the Cross Bar (optional) welds.
5. **Sheets 6 and 7:** Added new Note 6 which reads, "Holes should be located approximately as shown but align near the center of the interfacing angle iron." The note corresponds to changing most screw hole locations from basic dimensions to reference dimensions for the top and side cover panels.	During fabrication of the personnel barrier, the location of the top and side cross members (Items 1E and 1K) is dependent on the item length, joint fit-up, personnel barrier width, and weld shrinkage. In some cases, the hole locations in the top and side covers align with the perpendicular web of the interfacing Items 1E and 1K angle irons. Allowing the hole locations to be referenced dimensions will ensure the holes and corresponding screws are positioned appropriately without affecting the strength of the personnel barrier members. This change does not affect the design of the 9516 package.	The Top Cover shown in Sheet 6, and the Side Cover shown in Sheet 7 are removed for loading and unloading the Cask in the Cask Frame. These covers are attached to the Cask Frame using machine screws. Slight changes of the hole locations will not affect the Cask Frame performance under NCT, and the covers are not credited to survive HAC impacts (e.g., a structural safety function of Cask Frame is as an impact limiter). Staff concurs allowing reference dimensions for the hole locations should improve assembly of the Cask Frame without affecting the strength of the frame members.
6. **Sheet 6 Zone A-2 and Sheet 7 Zone B-8:** Allowed localized chamfers on the back side of the top and side removable cover panels to allow clearance to interfacing welds.	Personnel barrier item lengths, weld size, and straightness as well as the removable cover panel size can affect the interface between the removable panels and the personnel barrier welds. Interference between the welds and the panels can prevent the panels from sitting flush on the personnel barrier cross members. Allowing localized chamfers will ensure	See evaluation of Item 5. Staff concurs this design change improves the assembly of the Cask Frame without affecting its safety performance.

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	the panels sit flush on the cross members thus meeting the design intent of the interface. This change does not affect the design of the 9516 package.	
7. **Sheet 8 Zones C-2 and C-3:** Identified the surfaces to be oxide coated instead of the surfaces that should not be oxide coated.	This is a simplification to identify the two exterior surfaces that will be coated instead of the five interior surfaces that won't be coated. This also provides consistency with drawing Sheet 9 that shows the exterior of the cask is to be coated. This change does not affect the design of the 9516 package.	Staff concurs this change clarifies the coating requirement for the Cask Lid.
8. **Sheet 9 Zone F-1:** Allowed additional weld passes to be GTAW (Gas Tungsten Arc Weld) or FCAW (Flux Core Arc Weld) instead of just FCAW. The root of the weld will continue to be GTAW.	FCAW is typically used on large welds due to the greater amount of material that can be deposited than GTAW for each weld pass. GTAW welds are often placed on FCAW welds to dress the weld and improve appearance. Thus, the selected weld process is often for productivity and appearance. This change does not affect the design of the 9516 package.	Both GTAW and FCAW can be used for ASME BPVC Section III Division 1 fabrication. Staff concurs that the GTAW option for this Cask Body weld provides fabrication flexibility without affecting the safety performance of the package.

The applicant also performed and documented a chapter-by-chapter evaluation of the proposed changes relative to the SARP in Section 7.3 of ECAR-7969. DOE PCP staff reviewed the evaluation and concurred that the changes to Drawing 756179 do not affect the structural, thermal, containment, radiation shielding, and nuclear criticality performance of the package, and also do not affect package operations, acceptance tests and maintenance program, and quality assurance program requirements.

Based on the statements and representations in the INL technical justification (ECAR-7969), and PCP staff's confirmatory evaluation describe in this SER, staff finds this amendment to the packaging design acceptable and will provide reasonable assurance that the regulatory requirements of 10 CFR Part 71 have been met subject to the Conditions in the CoC.

Conditions of Approval

The following changes to CoC Rev 12 are required to implement changes evaluated in this SER.

- 5(a)(3) Drawings: Change revision of Drawing No. 756179 from Rev 5 to 6.
- 5(d) Conditions:
  - (10) revise to "Revision 11 and 12 of this certificate may be used until December 31, 2024 and January 31, 2025, respectively."
- 5(e) Supplements:
  - Add (11) "9516 Shipping Cask Drawing Adjustments, ECAR-7969 Rev 0, October 1, 2024."

Conclusion

Based on the statements and representations contained in the INL technical justification, and the conditions listed above, DOE PCP staff concludes that the package design has been adequately described and evaluated, and the Model 9516 package continues to meet the requirements of 10 CFR Part 71.

References

[1] *9516 package, Docket Request*, Email Nathan McBride to Julia Shenk, June 21, 2024.
[2] *RE: CCN 256342 9516 SARP Cask Drawing Trans Ltr,* Email Nathan McBride to Julia Shenk, July 17, 2024.
[3] *9516 Shipping Cask Drawing Adjustments*, Engineering Calculations and Analysis, ECAR-7969, Rev 0, effective date October 1, 2024.
[4] *9516 Shipping Container Cask Frame*, Drawing 756179, Revision 6 (11 Sheets), effective date September 30, 2024.