



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION REPORT
Docket No. 71-9291
Model No. LIQUI-RAD Package
Authorization for Continued Shipments

BACKGROUND

Operating Procedures of the Model No. LIQUI-RAD (LR) package include a visual inspection of all accessible welds for cracks or corrosion; those procedures also require that the package should not be used if cracks or corrosion are discovered. In addition to the routine inspections prior to loading the LR package, the package owner is expected to maintain the packaging using the guidelines provided in Chapter 8 –Acceptance and Maintenance Programs - of the application. Typical conditions for discontinued use include through-the-thickness corrosion, weld cracks, or damage to the extent that adequate thermal or impact protection of the containment vessel is no longer provided by the packaging.

Some degree of corrosion can be expected, from routine use, on a package with carbon steel structural components due to scratches or wear through the protective painted coating; in that case, the user may remove this light surface corrosion by polishing as required. If the corrosion is not easily removed or if pitting or scaling is observed, the unit should be repaired by the owner and re-certified for use.

The certificate of compliance (CoC) holder proposed several changes to the pre-loading inspections, more detailed written instructions for acceptance criteria, a periodic maintenance, and provided an engineering evaluation that establishes visual inspection standards to ensure the physical condition of the package is not impaired. This evaluation compares the current state of the LR packaging with the requirements of the licensing drawing and the safety analysis report (SAR) and provides recommendations for inspection of the packaging to allow the continued use of the package until an amendment request is submitted.

EVALUATION

The staff reviewed the description of nonconformance, which included discussions of SAR Chapter 7.1.1 “Pre-loading inspection,” and the regulatory requirements in Title 10 *Code of Federal Regulations* (10 CFR) Section 71.87, Routine determinations. The applicant stated that the requirements for pre-loading inspection in the SAR lack sufficient detail for the package user to be able to specify acceptance criteria for corrosion observed on the exterior of packages in more detailed operating procedures.

The applicant also stated that an engineering evaluation had been done to establish acceptance criteria for corrosion observed during pre-loading inspections: LR packages meeting the new visual inspection standards and acceptance criteria for pre-loading inspections may continue to be used. The applicant also stated that the SAR did not include a sufficiently detailed rationale for corrosion acceptance criteria when corrosion is discovered on the exterior of the package during routine operations and periodic maintenance.

Enclosure

The applicant proposed a change to the pre-loading inspection to allow for corrosion, provided that the physical condition of the package is not impaired. The applicant stated that more detailed acceptance criteria for allowable corrosion is provided by an engineering evaluation, and that the new visual inspection standards ensure the physical condition of the package is not impaired.

The applicant provided the detailed visual inspection standards in Enclosure 3 – Special Routing Log Number SR16907, which contains the visual inspections to be performed and the acceptance criteria to be met. The applicant also provided the completed inspection forms for packages which meet the SR16907 acceptance criteria:

LR230-02	LR230-13	LR230-25	LR230-36	LR230-42
LR230-07	LR230-14	LR230-27	LR230-37	LR230-44
LR230-08	LR230-17	LR230-28	LR230-38	LR230-46
LR230-09	LR230-18	LR230-30	LR230-39	LR230-47
LR230-10	LR230-21	LR230-32	LR230-40	LR230-48
LR230-12	LR230-24	LR230-35	LR230-41	LR230-50

Path Forward and Corrective Action Plan

The applicant stated that packages not conforming to SR16907 visual inspections and acceptance criteria have been removed from service and will follow the maintenance program to be repaired and returned to service once the LR packages are restored to specifications as stated in the SAR.

The LR package certificate holder will prepare an amendment application to revise the CoC, which will include a more detailed inspection criteria for corrosion on the exterior surface of the package to ensure that it is maintained in an unimpaired physical condition.

The applicant stated that the SAR operating and maintenance instructions revisions will be completed prior to expiration of the CoC No. 9291 Letter Authorization. The applicant stated that the shipments for authorized LR packages will continue until the expiration of the CoC No. 9291 Letter Authorization.

Staff Review of Nonconformance

The staff reviewed the visual inspections and acceptance criteria described in the Special Routing Log Number: SR16907. The procedure consists of a series of six visual inspections of the structural and sheet materials and one weld inspection. There are also criteria described for the personnel performing the inspections including visual acuity, time of day performed, and maximum distance criteria. The staff also reviewed the acceptance criteria, which the applicant delineated between sheet metal corrosion allowance, structural steel corrosion allowance, and weld corrosion allowance.

For sheet metal, the tolerance range was based on American Society for Testing and Materials (ASTM) A568 and specified the width of the allowed corrosion. The staff verified that the corrosion limit specified by the applicant was in accordance with ASTM A568 thickness tolerances for the specified width for the 10 gauge steel specified in SAR drawing number LR-SAR.

For structural steel, the permitted variation in thickness is based on ASTM A6, Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling, and the specified thickness (including paint thickness). The staff verified that for

the range of components used in the LR package, the 0.03" permitted variance in thickness for the carbon steel specified in the SAR drawing is in accordance with the ASTM A36 specification for carbon structural steel and the A500 specification for the carbon steel structural components.

For welds, the thickness maintained must be greater than or equal to either the minimum thickness of the components that make up the weld joint or the minimum specified weld dimension in the license drawing. Fillet welds at the interface between the bottom plate and 10-gauge shell should have a minimum thickness of 0.125" per the licensing drawing. Full penetration welds on the other hand must meet the minimum thickness of the base metal. The staff finds that the specified acceptance criteria for the weld minimum thickness that is greater than or equal to the thickness of the component is acceptable because the acceptance criteria is consistent with the dimensions included in the license drawings.

The staff reviewed Appendix A of SR16907, which detailed the visual inspection process, including visual inspections at six areas of the package and a weld inspection which utilizes a weld gauge on welds with indications of corrosion. Two of these visual inspections and a weld inspection include measurements, VS-1 for the nameplate, VS-6 for the structural angles, and WI-1 using the weld gauge for the frame welds.

VS-1 is used for the nameplate, which can be subject to galvanic and spot rusting through a combination of dissimilar metals and the heat affected zone caused by welding. VS-1 requires a 0.1300" minimum thickness verified by ultrasonic inspection to pass.

VS-6 is used for the various structural angles that can exhibit spot rusting due to handling damage or other types of mechanical loads. VS-6 requires a 0.2700" minimum to pass.

WI-1 is used for the inspection of welds with indications of corrosion. The acceptance criteria is based on the type of weld. For fillet welds this is 0.125". Full penetration welds must meet the corrosion allowance for structural steel (as defined above) verified using a weld gauge.

Additionally, the applicant noted that any areas of corrosion that were unclear in meeting the criteria of the six visual inspections and weld inspection would be measured with a UT instrument, and welds that were suspect would be cleaned as necessary and measured with a gauge and recorded in the Inspection Report Forms.

The staff determined that the change to pre-loading inspection is acceptable as the applicant defined in SR16907 detailed inspection and acceptance criteria for the LR package that meet ASTM standards.

The staff reviewed the inspection reports provided by the applicant for the 30 packages which met the SR16907 acceptance criteria. The staff determined that the visual inspection process described in Appendix A and the documented inspection reports for the 30 LR230 packages demonstrate that the package continues to meet 10 CFR Part 71 requirements.

The staff determined that the change to pre-loading inspection is acceptable as the applicant defined in SR16907 detailed acceptance criteria for the LR package that meet ASTM standards.

Staff Review of Path Forward and Corrective Action Plan

The staff reviewed the path forward and corrective actions proposed by the applicant. The staff determined that the path proposed by the applicant was acceptable as packages not conforming to SR16907 will only be returned to service after refurbishment and returned to specifications, and the operating and maintenance program will be updated in the SAR in an amendment application.

Based on the above, the staff found that the applicant's proposed changes to the operating procedure do not affect the ability of the package to meet 10 CFR Part 71 requirements.

CONDITIONS

The staff finds that continued shipments in the Model No. LIQUI-RAD package meet regulatory requirements, provided the following restrictions are met:

- (1) This authorization is only valid for packages with the following serial numbers below. Such packages currently meet the revised corrosion acceptance criteria on the exterior surfaces and are in unimpaired physical condition except for superficial defects such as marks or dents.

LR230-02 LR230-13 LR230-25 LR230-36 LR230-42

LR230-07 LR230-14 LR230-27 LR230-37 LR230-44

LR230-08 LR230-17 LR230-28 LR230-38 LR230-46

LR230-09 LR230-18 LR230-30 LR230-39 LR230-47

LR230-10 LR230-21 LR230-32 LR230-40 LR230-48

LR230-12 LR230-24 LR230-35 LR230-41 LR230-50

- (2) The packages listed above shall be removed from service if, at any time during the duration of this letter authorization, they no longer meet the preloading inspection requirements. Once a package is taken out of service, it cannot be brought back into service using this letter authorization.
- (3) Any package that undergoes refurbishment is no longer to be considered as being on the approved list above and cannot be used.
- (4) Prior to transport, package dose rates shall be measured at all locations necessary to demonstrate compliance with 10 CFR 71.47.
- (5) All other conditions of CoC No. 9291 shall remain the same.
- (6) This authorization shall expire on July 31, 2024.

CONCLUSIONS

Based on the statements and representations in the application dated June 12, 2023, as supplemented, the staff agrees that the use of the Model No. LIQUI-RAD package with the serial numbers listed in this SER meets the requirements of 10 CFR Part 71, subject to the conditions listed above.