

SAFETY EVALUATION REPORT

Docket No. 71-9322
Model No. LACBWR RPV
Special Package Authorization
Revision No. 1

SUMMARY

On September 14, 2006, Duratek, Inc, (Duratek) submitted a request for a revision to its Special Package Authorization for the LACBWR Reactor Pressure Vessel (LACBWR RPV) Type B transportation package. Duratek requested that the outer layer of supplemental shielding on the package be revised to be optional. The basis of the request is the actual dose rate measurements from the reactor vessel were lower than previously estimated. Staff has reviewed the request, dose measurements, and drawings and determined that the change to make the shielding optional is acceptable.

BACKGROUND

Duratek was issued a Special Package Authorization for the LACBWR Reactor Pressure Vessel (RPV) Package on April 27, 2006. The authorization approved an application for a transportation package for the La Crosse Reactor Pressure Vessel. The authorization was issued in accordance with the requirements of 10 Code of Federal Regulations (CFR) 71.41(d). This regulation allows for special consideration for package approval for unusual packages that will be transported one-time only. This package will transport the reactor pressure vessel to a disposal site. The original shielding design was based on measurements of the exterior of the reactor vessel. Preparation of the vessel included grouting the internal structure. After grouting was completed, dose rates were again measured and determined to be significantly lower than the dose rates measured prior to grouting. The shielding was re-evaluated by Duratek and it proposed that the outer supplemental shielding be made optional depending on the dose rate measurements once the cylindrical supplemental shield is installed.

SHIELDING EVALUATION

Package Description and Contents

The LACBWR RPV package is described in the original special package authorization request. The RPV package is a 1½-inch thick two-piece cylindrical steel shell welded to 4-inch thick top and bottom plates. The package is approximately 10½ feet in diameter and 39½ feet long. The package shell is 1½ inches thick with additional shielding welded to the exterior surface of the cylindrical shell in the area where the core was located. This additional shielding consists of two parts. The first is a 10-foot long, 1¼-inch thick cylinder welded to the outside of the main RPV package and centered on the core midplane. The second (supplemental) part consists of two curved 8-foot long, steel plates welded to the outer shield cylinder and centered on the core midplane. They are sized and located so that each one covers a 120° sector (circumferentially) on the side of the RPV package when it is placed on a conveyance for transportation. If the package meets the requirements of 10 CFR 71.47 after the 1¼-inch thick cylindrical shield is

installed, the supplemental shield plates would not be installed. If the package did not meet the requirements of 10 CFR 71.47, the supplemental shield plates would be installed. These shield plates would have a thickness of up to 1¾ inches and would otherwise be as described in the original Special Package Authorization request. The package contents are stated in the Safety Evaluation Report accompanying the Special Package Authorization letter (ML061170655).

Source Specification

The source specification has not changed from that specified in the original request for Special Package Authorization and therefore has not been reviewed for this amendment.

Shielding Evaluation

The applicant has requested this amendment based on the difference between calculated dose rates and dose rates actually measured after grouting was completed. Since the decision on whether to install the supplemental shield plates will be made based on actual measurements, rather than on calculations, staff did not perform any confirmatory calculations.

As indicated in the set of measurements included with the amendment request, the dose rates measured on the RPV package after grouting were as high as 2.7 rem/hour (hr). Dose rates required under Normal Conditions of Transport (NCT) for this shipment are listed in Table 1. Based on these measurements, the shield cylinder will need to reduce the contact dose rate by more than an order of magnitude to reduce the 2.7 rem/hr measured to the maximum of 200 mrem/hr allowed. Whether the shield cylinder will provide this much attenuation depends on the energy of the emitted radiation. The applicant will determine the necessity for the supplemental shield plates by making a thorough survey as specified in 10 CFR 71.47. If the shield cylinder does not provide sufficient attenuation, the supplemental shield plates will be installed.

Normal Conditions of Transport

The low density cellular concrete (LDCC) filling the RPV is assumed to remain intact under NCT and thus keep the internals from shifting and changing the dose profile on the outside of the package. As mentioned above, Table 1 lists the dose rates required to be met under NCT for this shipment. The supplemental shield plates, when installed as per the applicant's procedures, are expected to remain in place during NCT.

Table 1. Dose Rate Limits from 10 CFR 71.47 (mrem/hr)

	Package Surface			2 Meters from Package Surface*	
	Side	Top of load	Underside	Side	Ends
10 CFR 71.47(b) Limit	200	200	200	10	10
* This is less than or equal to the distance specified in the regulations (2 meters from the vertical planes projected by the outer lateral edges of the vehicle) and as thus it is conservative.					

Hypothetical Accident Conditions

The shielding analysis in the original Special Package Authorization application assumed the supplemental shield plates would detach under hypothetical accident conditions (HAC). Since the optional presence of the supplemental shield plates does not affect the ability of the package to meet the dose rate requirements under HAC, the conclusion in the original Safety Evaluation Report that the external dose rate requirements in 10 CFR 71.51(a)(2) have been met is still valid.

Operational Considerations

As specified in Section 7.1.3 of the SAR, radiation and contamination surveys will be performed prior to offsite transport. The radiation surveys will verify that none of the applicable limits in 10 CFR 71.47 is exceeded. While no external contamination is expected on the package, contamination surveys will confirm that the requirements of 10 CFR 71.87(i) have been met.

Structural Considerations

The changes to the shielding will not impact the structural integrity of the package because the outer layer of the shielding is not located at the critical region of the package. Therefore, removing or reducing the shielding simply reduces the mass of the package.

CONCLUSION

Based upon the staff's review of the original shielding evaluation and the measurements provided with the amendment request, the staff concludes that the shielding requirements in 10 CFR 71.47 and 71.51(a) will be met and that the package design meets the requirements of a Special Package Authorization of 10 CFR Part 71 with respect to shielding. Therefore, for this one-time shipment, it is acceptable to allow the determination for the need for supplemental shield plates described in the Special Package Authorization request and the subsequent amendment request (with the thickness as indicated in this SER) to be based on measurements made after the shield cylinder is installed on the RPV.

CHANGES TO THE SPECIAL PACKAGE AUTHORIZATION

The Special Package Authorization for the Model No. LACBWR transportation package is modified to allow the supplemental shielding to be optional. Condition 5 is revised to read as follows:

- “(5) The package is constructed and assembled in accordance with Duratek, Inc., Drawings: C-068-163041-002, Rev. 1; C-068-163041-003, Rev. 0; C-068-163041-004, Rev. 0. The 1 3/4" supplemental shielding plates identified as optional on Drawing C-068-163041-002, Rev. 1, may be omitted or may be replaced with shield plates less than 1 3/4" thick, provided that the plates are of the same configuration, material of construction, and type of attachment as those specified.”