



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

**SAFETY EVALUATION REPORT**  
**Docket No. 71-9225**  
**Model No. NAC-LWT**  
**Certificate of Compliance No. 9225**

**SUMMARY**

By application dated March 30, 2015, as supplemented on May 11, 2015, NAC International (NAC or the applicant) requested a revision to Certificate of Compliance (CoC) No. 9225 for the Model No. NAC-LWT (NAC-LWT) transportation package. NAC requested an additional bottom spacer for the high enriched uranyl nitrate liquid (HEUNL) containers and added alternate material specifications for the HEUNL container. The U.S. Nuclear Regulatory Commission (NRC) staff performed its review of the application as supplemented using the guidance in NUREG-1609, "Standard Review Plan for Transportation Packages for Radioactive Materials."

Based on the statements and representations in the application, as supplemented, the NRC staff agrees that these changes do not affect the ability of the package to meet the requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 71.

**1.0 GENERAL INFORMATION**

**1.1 Packaging Description**

The NAC-LWT package is a Type B(U)F-96 radioactive material transportation package. It is authorized to transport several types of contents, including light-water reactor and research reactor spent fuel, and HEUNL in containers specifically designed for the liquid. The NAC-LWT package is shipped by truck, boat, or railcar and depending on the content, within an international shipping organization (ISO) container.

**1.2 Packaging Drawings**

The applicant revised three drawings that show the design of the HEUNL containers to transport the HEUNL, and its configuration within the NAC-LWT package.

The revised drawings include:

LWT 315-40-180, Rev. 4P

LWT 315-40-181, Rev. 6P (sheets 1 - 2)

LWT 315-40-182, Rev. 3P (sheets 1 - 2)

LWT Transport Cask Assembly, HEUNL  
Contents

Container Assembly, HEUNL

Container Spacer, HEUNL

## 2.0 STRUCTURAL EVALUATION

### 2.1 Description of Structural Design

The NAC-LWT package consists of six major components: (1) the package body, (2) the closure lid and bolts, (3) the neutron shield/expansion tanks, (4) the trunnions, (5) the internals, and (6) the energy absorbing impact limiters, which are located over the ends of the cask. The bottom plate, the inner shell, the upper ring and the closure lid, including seals and bolts, form the primary containment boundary. None of these have changed as a result of this revision. This revision includes changes to the HEUNL container spacer design and adding optional HEUNL container material specifications.

#### 2.1.1 Discussion

The applicant added an additional spacer design for use with the HEUNL for operational convenience during horizontal loading of the HEUNL containers into the package to reduce the likelihood of scratching the inside of the NAC-LWT package. The new spacer design is listed as item number 98 on Drawing No. LWT 315-40-182, Rev. 3P, sheet 2 of 2. The HEUNL container material specifications are for alternative procurement options. The applicant states that the material specification changes do not alter any of the previously approved material performance requirements other than the material specifications. The staff limited the scope of the structural review to the areas of the safety analysis report that are affected by the change to the spacer which include the free drop evaluations for both normal conditions of transport and hypothetical accident conditions and the material specification changes.

#### 2.1.3 Weights and Centers of Gravity

Table 2.2.1-2 indicates that the change in the weight of the NAC-LWT package loaded for shipment is insignificant as a result of the new spacer design, and the axial center of gravity remains unchanged.

The staff has reviewed the package structural design description and concludes that the content of the application meet the requirements of 10 CFR 71.33.

### 2.2 Materials Evaluation

The materials evaluation assessed the acceptability of using alternate American Society of Mechanical Engineers (ASME) and ASTM International material specifications and to include an additional HEUNL container bottom spacer design.

The applicant stated that the added material specifications are for alternative procurement options. The material specification changes do not alter any of the previously approved material and performance requirements other than the material specification. The additional spacer design is to accommodate containers during horizontal loading and reduces the likelihood of damage to the inside of the NAC-LWT cask.

The NRC staff finds that no change in mechanical properties is cited as part of this specification request for the HUENL inner containers and does not change the allowed carbon content. Design changes to the additional spacer form, fit, and function shall be proven through operation and are constructed from Type 304 stainless steel consistent with previously approved materials of fabrication for this transportation package. Therefore the staff finds the

requested ASME and ASTM specifications for the affected HEUNL assembly and spacer design changes to be acceptable.

The staff concludes that the changes to the NAC-LWT package meets the regulatory requirements for assuring that there will be no significant galvanic or chemical reactions and is constructed with materials and processes in accordance with acceptable industry codes and standards.

## 2.6 Normal Conditions of Transport

### 2.6.7 Free Drop

The applicant evaluated the HEUNL container and the spacer for the 1-foot side, bottom end and top end drops, using the same finite element model that was used for the previous design with the appropriate material and geometric changes. The evaluation considered the membrane and bending stresses in the container and the spacer, bearing stresses on the guide rail and the support spacer and buckling of the container walls. In all cases, the licensee reports minor changes in the component stresses and margins of safety which remain positive. The maximum membrane stress in the spacer is significantly reduced as a result of the new design.

The staff has reviewed the applicant's evaluation of the packaging structural performance under the normal conditions of transport and concludes that there will be no substantial reduction in the effectiveness of the packaging and that it meets the requirements of 10 CFR 71.71.

## 2.7 Hypothetical Accident Condition

### 2.7.1 Free Drop

The applicant evaluated the HEUNL container and the spacer for the 30-foot side, bottom end and top end drops, using the same finite element model that was used for the previous design with the appropriate material and geometric changes. The evaluation considered the membrane and bending stresses in the container and the spacer, bearing stresses on the guide rail and the support spacer, and buckling of the container walls. In all cases, the applicant reports minor changes in the component stresses and margins of safety which remain positive. The maximum membrane stress in the spacer is significantly reduced as a result of the new design.

The staff has reviewed the applicant's evaluation of the packaging structural performance under the hypothetical accident conditions and concludes that there will be no substantial reduction in the effectiveness of the packaging and that it meets the requirements of 10 CFR 71.73.

Based on review of the statements and representations in the application, the staff concludes that the structural design has been adequately described and evaluated and that the package has adequate structural integrity to meet the requirements of 10 CFR Part 71.

## 3.0 THERMAL EVALUATION

The revisions requested by NAC do not affect the thermal performance evaluation and do not alter the staff's previous review of the thermal evaluation for the NAC-LWT package since the total decay heat of the system remains unchanged. Therefore, the package remains in

compliance with the thermal requirements in 10 CFR Part 71. The staff did not reevaluate this area for this amendment request.

#### **4.0 CONTAINMENT EVALUATION**

The revisions requested by NAC do not affect the containment system and do not alter the staff's previous containment evaluation of the NAC-LWT package. Therefore, the package remains in compliance with the containment requirements in 10 CFR Part 71. The staff did not reevaluate this area for this amendment request.

#### **5.0 SHIELDING EVALUATION**

The revisions requested by NAC do not affect the shielding performance and do not alter the staff's previous shielding evaluation of the NAC-LWT package. Therefore, the package remains in compliance with the shielding requirements in 10 CFR Part 71. The staff did not reevaluate this area for this revision request.

#### **6.0 CRITICALITY EVALUATION**

The revisions requested by NAC do not affect the criticality performance and do not alter the staff's previous criticality evaluation of the NAC-LWT package. Therefore, the package remains in compliance with the criticality requirements in 10 CFR Part 71. The staff did not reevaluate this area for this revision request.

#### **7.0 OPERATING PROCEDURES EVALUATION**

The revisions requested by NAC do not affect the operating procedures and do not alter the staff's previous evaluation of the operating procedures for the NAC-LWT package. Therefore, the package remains in compliance with the operating procedure requirements in 10 CFR Part 71. The staff did not reevaluate this area for this revision request.

#### **8.0 ACCEPTANCE TESTS AND MAINTENANCE REVIEW**

The revisions requested by NAC do not affect the acceptance tests and maintenance programs and do not alter the staff's previous evaluation of the acceptance tests and maintenance programs of the NAC-LWT package. Therefore, the package remains in compliance with the acceptance tests and maintenance program requirements in 10 CFR Part 71. The staff did not reevaluate this area for this revision request.

### **CONDITIONS**

The following changes have been made to the certificate:

Condition 5.(a)(3)(iii) was revised to include the following drawings:

LWT 315-40-180, Rev. 4P	LWT Transport Cask Assembly, HEUNL
LWT 315-40-181, Rev. 6P (sheets 1 - 2)	Contents
LWT 315-40-182, Rev. 3P (sheets 1 - 2)	Container Assembly, HEUNL
	Container Spacer, HEUNL

Condition 20 was added to authorize continued use of the NAC-LWT package for approximately 1 year.

Condition 20 has been renumbered to be Condition 21.

Condition 21 has been renumbered to be Condition 22.

The references section has been updated to include the supplements dated March 30 and May 11, 2015.

## **CONCLUSION**

CoC No. 9225 has been revised to add an additional spacer for the HEUNL containers and a material specification for the HEUNL container as specified above in the Model No. NAC-LWT package. Based on the statements and representations in the application, and with the conditions listed above, the staff agrees that this amendment does not affect the ability of the package to meet the requirements of 10 CFR Part 71.