

8 OPERATING PROCEDURES EVALUATION

8.1 Review Objective

The objective of this U.S. Nuclear Regulatory Commission (NRC) operating procedures evaluation is to verify that the operating controls and procedures for the package (packaging together with contents) meet the requirements in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 71, "Packaging and Transportation of Radioactive Material" and that the package will be operated in a manner consistent with its design and evaluation for approval.

8.2 Areas of Review

The NRC staff should review the application to verify that it adequately describes the package and includes adequately detailed drawings. In general, the staff should review the following information to determine the adequacy of the package description:

- package loading
 - preparation for loading
 - loading of contents
 - preparation for transport
- package unloading
 - receipt of package from carrier
 - preparation for unloading
 - removal of contents
- preparation of empty package for transport
- other procedures

8.3 Regulatory Requirements and Acceptance Criteria

This section summarizes those sections of 10 CFR Part 71 relevant to the review areas addressed in this standard review plan (SRP) chapter. Table 8-1 shows the relationship between the relevant regulatory requirements and the areas of review materials. The NRC staff reviewer should refer to the exact language in the regulations.

The application should specify that the package is operated in accordance with written procedures that are presented sequentially in the order of performance, as noted in the following sections.

8.3.1 **Package Loading**

The application must identify established codes and standards applicable to the use of the package [10 CFR 71.31(c)]. Leakage testing of the package should specify the package leak rate limits and meet the assembly verification leakage test requirements specified in American National Standards Institute (ANSI) N14.5, "Radioactive Materials—Leakage Tests on Packages for Shipment."

Table 8-1 Relationship of Regulations and Areas of Review for Transportation Packages						
Area of Review	10 CFR Part 71 Regulations					
	71.31(c)	71.35(c)	71.43(g)	71.47(b)(c)(d)	71.87	71.89
Package loading	•	•	•	•	•	•
Packaging unloading		•				•
Preparation of empty package for transport					•	
Other procedures	•	•				

8.3.2 Package Unloading

The application should include inspections, tests, and special preparations for package unloading. The application should describe the procedures for opening the package and removing the contents. As applicable, the operating procedures in the application should also describe the operations used to ensure safe removal of fission or other radioactive gases, contaminated coolant, and solid contaminants. The application should also address the conduct of radiation and contamination surveys, inspection of the tamper-indicating device, and any proposed special controls and precautions needed for handling and unloading. Operating procedures must address measures to comply with the radiation-protection requirements in 10 CFR 20.1906, "Procedures for Receiving and Opening Packages." [10 CFR 71.35(c) and 10 CFR 71.89, "Opening Instructions"]

8.3.3 Preparation of Empty Package for Transport

The application should address inspections and tests to be performed for determining the level of nonfixed (removable) contamination on external surfaces of the package. [10 CFR 71.87, "Routine Determinations"] The interior of the packaging should be properly decontaminated, closed, and prepared for transport in accordance with the requirements of 49 CFR 173.428, "Empty Class 7 (Radioactive) Materials Packaging."

8.3.4 Other Procedures

The application must include any proposed special controls and precautions for the transport, loading, unloading, and handling of a transportation package and any proposed special controls in the case of accident or delay [10 CFR 71.35(c)]. Special controls and precautions can address such aspects as the route, weather, escorting shipments, and shipping time restrictions. The package should be properly closed and delivered to the carrier in such a condition that subsequent transport will not reduce the effectiveness of the packaging.

8.4 Review Procedures

The package operation and shipment preparations must be performed in accordance with detailed written procedures [10 CFR 71.87(f)]. The applicant should submit a high-level description of the essential elements needed to prepare the package for shipment to assure safe performance of the package under normal conditions of transport and hypothetical accident conditions. The application should present these steps in sequential order, as applicable. Sequencing of operational steps should be flexible when performance of the activities in a different order would not affect package preparation, and the application should identify that

flexibility. The Operating Procedures section of the application is typically included by reference in the certificate of compliance as conditions of the package approval.

Verify that the operating controls and procedures meet the requirements of 10 CFR Part 71 and that these procedures are adequate to ensure that package users will operate the package in a manner consistent with its design and evaluation for approval. Appendix A to this SRP provides additional guidance regarding operating controls and procedures for several package types. Verify that the application includes a clear description of the essential elements needed to prepare the package for shipment and addresses the steps specified in 10 CFR 71.87. Verify that the package operation described in the application focuses only on those steps needed to ensure the package performance; excessive detail and specificity, with respect to package operations, are not needed. Instead, the application should allow flexibility with respect to steps that are not specifically related to package preparation. For example, the detailed written procedures may specify which lifting rigging to use to handle the package, whereas the operating procedures in the application would only address this in a generic way since the rigging may change at different facilities.

Refer to NUREG/CR-4775, "Guide for Preparing Operating Procedures for Shipping Packages," issued December 1988, when reviewing the application. This document describes what information should be presented in the application and what information should appear in the package user's more-detailed operating procedures.

The operating procedures evaluation is based in part on the descriptions and evaluations presented in the General Information, Structural Evaluation, Thermal Evaluation, Containment, Shielding Evaluation, Criticality Evaluation, and Materials Evaluation sections of the application. Results of the operating procedures review are considered in the Acceptance Tests and Maintenance Program review. An example of the information flow for the review of the operating procedures is shown in Figure 8-1.

The application appendix should include a list of references, copies of applicable references if not generally available to the reviewer, test results, and other appropriate supplemental information.

8.4.1 Package Loading

8.4.1.1 Preparation for loading

Verify that the application describes the procedures for package loading preparations sequentially in the order of performance, and ensure that the procedure descriptions, at a minimum, assure the following:

- The package is loaded and closed in accordance with written procedures.
- The contents are authorized in the certificate of compliance, including the use of a secondary container or containment, shoring, or dunnage, as applicable.
- The use of the package complies with the conditions of approval in the certificate of compliance, including verification that required maintenance has been performed.
- Any required moderator or neutron absorber is present and in proper condition.

- The package is in unimpaired physical condition.
- Any special controls and precautions for handling are identified and provided.

8.4.1.2 *Loading of contents*

Verify that the application describes the procedures for loading the package contents sequentially in the order of performance, and ensure that the procedure descriptions include, at a minimum, the following measures:

- identifies and describes the method(s) of loading the contents
- identifies and provides any special handling equipment, controls, or precautions
- describes the methods to drain and dry the package (e.g., vacuum drying), the effectiveness of the proposed methods, and the appropriate drying or dryness criteria if the package is loaded under water
- verifies that the package has been loaded properly; for commercial spent nuclear fuel (SNF) packages, consider Information Notice 2014-09, "Spent Fuel Storage or Transportation System Misloading," as part of the review related to this measure. Also, coordinate with the criticality reviewer to ensure that the package operations include any additional procedures that are necessary for commercial SNF packages that rely on burnup credit

8.4.1.3 *Preparation for transport*

Verify that the application describes the procedures for preparing the package for transport sequentially in the order of performance, and ensure that the procedure descriptions include, at a minimum, the following measures:

- Each closure device of the package, including seals and gaskets, is properly installed, secured, and free of defects.
- The package is closed appropriately in accordance with specified bolt torques as delineated in the drawings and bolt-tightening sequences. Ensure that the application includes the operational guidance, such as specified torquing sequences, lubrication, and torque values, provided in Section 8 of NUREG/CR-6007, "Stress Analysis of Closure Bolts for Shipping Casks," issued April 1992.
- Nonfixed (removable) radioactive contamination on external surfaces is as low as reasonably achievable and within the limits specified in 49 CFR 173.443, "Contamination Control."
- The radiation survey requirements are described to confirm that the allowable external radiation levels are as expected and the limits specified in 10 CFR 71.47, "External Radiation Standards for All Packages," are not exceeded. If measured radiation levels exceed expected values, ensure that the package is properly loaded and investigate other possible sources of the discrepancy.

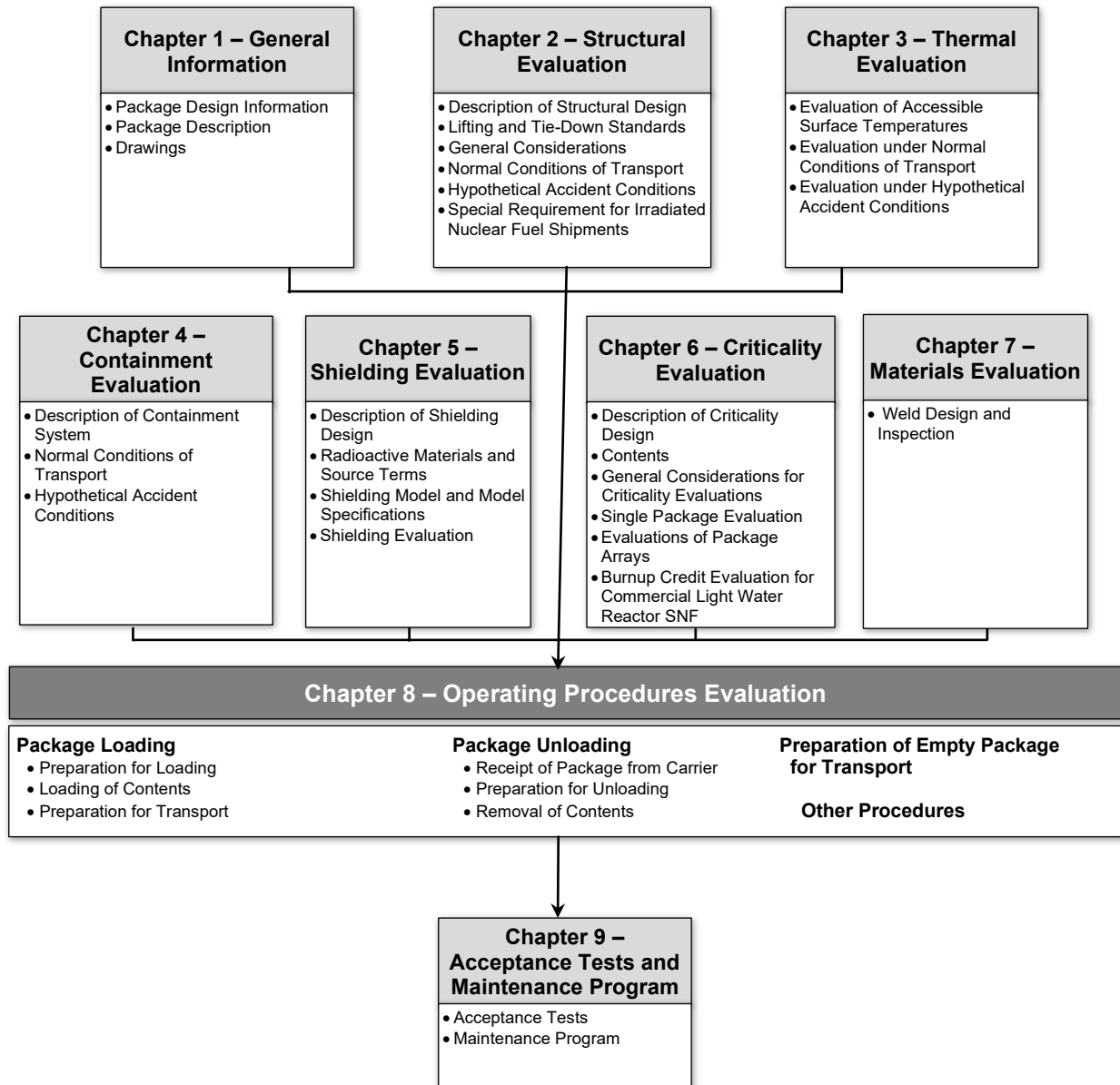


Figure 8-1 Information Flow for the Operating Procedures Evaluation

- The temperature survey requirements are described to verify that limits specified in 10 CFR 71.43(g) are not exceeded.
- The package leakage rate limits are specified and the package closures are leak tested in accordance with ANSI N14.5.
- Any system for containing liquid is properly sealed and has adequate space or other specified provision for expansion of the liquid.
- Any pressure-relief device is operable and properly set.

- Any structural component that could be used for lifting or tie-down during transport is rendered inoperable for that purpose unless it meets the design requirements of 10 CFR 71.45, "Lifting and Tie-Down Standards for All Packages."
- A tamper-indicating device is incorporated that, while intact, indicates that the package has not been opened by unauthorized persons.
- For a fissile material shipment, any special controls and precautions for transport, loading, unloading, and handling and any appropriate actions in case of an accident or delay that should be provided to the carrier or consignee are described.
- Written instructions to the carrier are provided for packages that require exclusive-use shipment because of external radiation levels [see 10 CFR 71.47(b), 10 CFR 71.47(c), and 10 CFR 71.47(d)].
- The licensee has sent or made available to the consignee any special instructions needed to safely open the package before delivery of a package to a carrier for transport, in accordance with 10 CFR 20.1906(e).
- The package is properly labeled.

Also, for commercial SNF packages (low-enriched uranium or mixed oxide), coordinate the review with the materials and thermal reviewers to ensure the package operations include procedures to prevent fuel oxidation consistent with at least one of the options described in the Cover Gas subsection in Section 7.4.14.2 of this SRP.

8.4.2 Package Unloading

8.4.2.1 Receipt of package from carrier

Verify that the application describes the procedures for package receipt sequentially in the order of performance, and ensure that the procedure descriptions include, at a minimum, the following measures:

- any special actions to be taken if the tamper-indicating device is not intact, or if surface contamination or radiation survey levels are too high
- any special-handling equipment needed for unloading and handling the package
- a description of any proposed special controls and precautions for handling and unloading
- adherence to the requirements of 10 CFR 20.1906
- examination of the package for visible external damage

8.4.2.2 Preparations for unloading

Verify that the application describes the procedures for package unloading preparations sequentially in the order of performance, and ensure that the procedure descriptions include, at a minimum, the following measures:

- procedures controlling the radiation level limits on unloading operations
- procedures for the safe removal of fission or other radioactive gases, contaminated coolants, and solid contaminants, if any

8.4.2.3 *Removal of contents*

Verify that the application describes the procedures for removing the package contents sequentially in the order of performance, and ensure that the procedure descriptions include, at a minimum, the following measures:

- the appropriate method, including any special instructions, to open the package
- the appropriate method to remove the contents
- verification that the contents are completely removed

8.4.3 **Preparation of Empty Package for Transport**

Verify that the application describes the procedures for preparation of an emptying package for transport sequentially in the order of performance, and ensure that the procedure descriptions include, at a minimum, the following measures:

- verification that the transportation packaging is empty
- verification that external and internal contamination levels meet the requirements of 49 CFR 173.428
- a description of any special preparations of the packaging to ensure that the interior of the packaging is properly decontaminated and the package is closed and prepared for transport in accordance with the requirements of 49 CFR 173.428
- a description of the package-closure requirements

8.4.4 **Other Procedures**

Confirm that procedures for any special operational controls are included (e.g., route, weather, escorting, or shipping time restrictions), as needed.

8.5 **Evaluation Findings**

Prepare evaluation findings upon satisfaction of the regulatory requirements in Section 8.3 of this SRP chapter. If the documentation submitted with the application fully supports positive findings for each of the regulatory requirements, the statements of findings should be similar to the following:

- F8-1 [If needed] The NRC staff has reviewed the proposed special controls and precautions for transport, loading, unloading, and handling and [if needed] the proposed special controls in case of accident or delay, and finds that they satisfy 10 CFR 71.35(c).
- F8-2 The NRC staff has reviewed the description of the operating procedures and finds that the package will be prepared, loaded, transported, received, and unloaded in a manner consistent with its design and evaluation for approval.

F8-3 The NRC staff has reviewed the description of the special instructions (if applicable) needed to safely open a package and concludes that the procedures for providing the special instruction to the consignee are in accordance with the requirements of 10 CFR 71.89.

The reviewer should provide a summary statement similar to the following:

Based on review of the statements and representations in the application, the NRC staff finds that the operating procedures have been adequately described and meet the requirements of 10 CFR Part 71.

8.6 References

10 CFR 20.1906, "Procedures for Receiving and Opening Packages."

10 CFR Part 71, "Packaging and Transportation of Radioactive Material."

49 CFR 173.428, "Empty Class 7 (Radioactive) Materials Packaging."

49 CFR 173.443, "Contamination Control."

Institute for Nuclear Materials Management, ANSI N14.5-2014, "American National Standard for Leakage Tests on Packages for Shipment of Radioactive Materials," New York, NY.

Information Notice 2014-09, U.S. Nuclear Regulatory Commission, "Spent Fuel Storage or Transportation System Misloading," June 20, 2014. Agencywide Documents Access and Management System Accession No. ML14121A469.

NUREG/CR-4775, U.S. Nuclear Regulatory Commission, "Guide for Preparing Operating Procedures for Shipping Packages," UCID-20830, Lawrence Livermore National Laboratory, Livermore, CA, December 1988.

NUREG/CR-6007, U.S. Nuclear Regulatory Commission, "Stress Analysis of Closure Bolts for Shipping Casks," UCR-ID-110637, Lawrence Livermore National Laboratory, Livermore, CA, April 1992.