17 TECHNICAL SPECIFICATIONS EVALUATION

17.1 Review Objective

The objective of the U.S. Nuclear Regulatory Commission's (NRC's) review with regard to technical specifications is to ensure the conditions and technical specifications of the dry storage facility (DSF) license or dry storage system (DSS) certificate of compliance (CoC) are sufficient and include those conditions and limits that are necessary to ensure that the design and operations of the DSF or DSS will meet the requirements in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste and Reactor-Related Greater Than Class C Waste."

17.2 Applicability

This chapter applies to the review of applications for specific licenses to an independent spent fuel storage installation (ISFSI) or a monitored retrievable storage installation (MRS), categorized as a DSF. It also applies to the review of applications for a DSS CoC.

17.3 Areas of Review

This chapter applies to the evaluation of the proposed technical specifications that the applicant deems necessary for correct fabrication and safe operation of the proposed DSS or DSF. A comprehensive review of the proposed technical specifications will assess the applicant's compliance with the regulations to provide a level of control commensurate with the applicable regulations specified in Section 17.4 below. This chapter addresses the following areas of review:

- functional and operating limits, monitoring instruments, and limiting control settings
- limiting conditions
- surveillance requirements
- design features
- administrative controls

17.4 Regulatory Requirements and Acceptance Criteria

This section summarizes those parts of 10 CFR Part 72 that are relevant to the review areas addressed in this chapter. The NRC staff reviewer should refer to the exact language in the regulations. Tables 17-1a and 17-1b match the relevant regulatory requirements to the areas of review covered in this chapter.

Table 17-1a Relationship of Regulations and Areas of Review for a DSF (SL)

Areas of Review	10 CFR Part 72 Regulations		
	72.24(g)	72.26	72.44(c)(d)
Functional and Operating Limits, Monitoring Instruments, and Limiting Control Settings	●	●	●
Limiting Conditions	●	●	●
Surveillance Requirements	●	●	●
Design Features	●	●	●
Administrative Controls	●	●	●

Table 17-1b Relationship of Regulations and Areas of Review for a DSS (CoC)

Areas of Review	10 CFR Part 72 Regulations								
	72.236								
	(a)	(b)	(c)	(d)	(e)(f)(h)	(g)	(i)	(j)	(l)
Functional and Operating Limits, Monitoring Instruments, and Limiting Control Settings	●		●	●	●	●	●		●
Limiting Conditions	●		●	●		●			●
Surveillance Requirements			●	●		●		●	
Design Features		●	●	●	●	●	●		●
Administrative Controls	●		●	●			●		●

The applicant should identify, as needed, proposed license or CoC conditions, including technical specifications, that are necessary to maintain subcriticality, confinement, shielding, heat removal, and structural integrity under normal, off-normal, and accident conditions. In addition, the applicant should identify the basis for each of the proposed technical specifications by reference to the analysis in the safety analysis report (SAR).

While the regulations in 10 CFR 72.26, “Contents of application: Technical specifications,” and 10 CFR 72.44, “License conditions,” do not specifically require technical specifications for CoCs like they do for specific licenses, the regulations do allow for certificate conditions. For consistency with specific licenses, the staff has used technical specifications as the process for including conditions in CoCs. Examples of this include references in the regulations to “terms, conditions, and specifications” for a CoC that a general licensee would need to meet (see 10 CFR 72.212(b)(3), 10 CFR 72.212(b)(5)(i), 10CFR 72.212(b)(11), and 10 CFR 72.48(c)(1)(ii)(B)). Thus, proposed technical specifications should be provided in CoC applications. The proposed technical specifications should be derived with consideration of what is needed to ensure compliance with the requirements in 10 CFR 72.236, “Specific requirements for spent fuel storage cask approval and fabrication,” as Table 17-1b identifies.

For a DSF, the staff should refer to Regulatory Guide (RG) 3.62, "Standard Format and Content for the Safety Analysis Report for Onsite Storage of Spent Fuel Storage Casks," RG 3.61, "Standard Format and Content for a Topical Safety Analysis Report for a Spent Fuel Dry Storage Cask," and RG 3.48, "Standard Format and Content for the Safety Analysis Report for an Independent Spent Fuel Storage Installation or Monitored Retrievable Storage Installation (Dry Storage)."

For a DSS, the NRC staff can use NUREG-1745, "Standard Format and Content for Technical Specifications for 10 CFR Part 72 Cask Certificates of Compliance" as an appropriate template in the review of the technical specifications. However, the staff may impose alternative or additional technical specifications to NUREG-1745 guidance based on operational experience and uniqueness of the DSS design and operations and based on the NRC Office of the General Counsel legal interpretations that have been made since issuance of NUREG-1745. For example, interpretations made since the issuance of NUREG-1745 have found certain aspects of that guidance to be legally unacceptable. These aspects include the guidance in Section 2.2 of NUREG-1745 regarding an option for controlling and obtaining NRC approval of changes to some spent nuclear fuel (SNF) parameters outside of the technical specifications.

Additionally, NUREG-1745 indicates some items that are usually included as limiting conditions for operation (see Section 17.4.2, "Limiting Conditions," below) that may be dealt with in the administrative controls section (see Section 17.4.5, "Administrative Controls," below) of the technical specifications. In order for this option to be used, the administrative controls section would need to include appropriate programs, including program elements, and methods to ensure the conditions will be maintained for which a limiting condition for operation would otherwise have been specified. The applicant would then need to include descriptions of operations that implement the administrative controls' programs and methods in the operations description chapter of the SAR. The reviewer would need to coordinate review of these programs and methods with the reviewer of Chapter 11, "Operation Procedures and Systems Evaluation," of this standard review plan (SRP) to ensure that the SAR operations descriptions include the necessary operations to effectively and adequately implement the proposed programs and methods.

This chapter focuses on the technical specifications for a license or CoC, as appropriate; however, licenses and CoCs should include terms and conditions in addition to technical specifications that are necessary to ensure compliance with the regulations. NUREG-1745 includes descriptions and examples of standard CoC conditions that may also be applicable to a license. The staff should review approved licenses and CoCs similar to the DSF or DSS under review to garner information on the kinds of terms and conditions that should be included in licenses and CoCs, respectively.

17.4.1 Functional and Operating Limits, Monitoring Instruments, and Limiting Control Settings

Functional and operating limits, monitoring instruments, and limiting control settings should include limits placed on fuel, waste handling, and storage conditions to protect the integrity of the SNF and container, to protect the employees against occupational exposures, to ensure doses to the public will not exceed limits, to ensure subcriticality, and to guard against the uncontrolled release of radioactive materials.

17.4.2 Limiting Conditions

Limiting conditions identify the lowest functional capability or performance level of structures, systems, and components (SSCs) required for safe operation. Limiting conditions should include limits placed on fuel, waste handling, and storage conditions to protect the integrity of the contents and SSCs important to safety, and to ensure protection of employees against occupational exposures, to ensure doses to the public will not exceed limits, to ensure subcriticality, and to guard against the uncontrolled release of radioactive materials.

17.4.3 Surveillance Requirements

Acceptance criteria for establishing surveillance requirements include the frequency and scope of surveillance requirements to verify the performance and availability of SSCs important to safety, and, as needed, to verify that the bases for the proposed limiting conditions are maintained. Acceptance criteria also include verifying that the surveillance requirements are sufficient to verify that the limiting conditions, operating limits, functional limits, and limiting control settings are met and that monitoring instruments are performing as designed and needed.

17.4.4 Design Features

Design features should include the specific codes and standards to which DSS or DSF SSCs and design features will be fabricated, constructed, and tested and include other necessary design-specific specifications for SSCs (e.g., minimum flux trap sizes, minimum neutron absorber boron-10 content). The condition or technical specifications should also describe a process to address necessary deviations from the applicable codes. In such cases, the applicant should request authorization to use an alternative to the requirements of the applicable code. If the staff finds that the deviation does not adversely impact safety, it may authorize the requested alternative in writing.

Currently, there is an existing code for the design and construction of metallic SNF storage casks. This code is Subsection WC of Division 3 of Section III of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code. Subsection WC was first issued as the 2005 addenda to the 2004 ASME B&PV Code. The NRC staff has not taken a position regarding the acceptability of this subsection. In the past, the NRC staff has used Division 1 of the ASME B&PV Code and allowed alternatives to some provisions of that document judged to not be applicable to SNF storage casks. The NRC issued early SNF dry storage licenses and CoCs without documenting which specific alternatives to ASME B&PV Code, Section III that the staff had approved. Poor quality assurance practices during design and fabrication sometimes led to significant deviations from the ASME B&PV Code without appropriate certificate holder design review or NRC review and approval. Therefore, the applicant should document that fabrication, construction, and testing will be done in accordance with ASME B&PV Code, Section III, with proposed alternatives in the application.

Likewise, the NRC should document this information in the technical specifications along with its approval of the proposed alternatives in the safety evaluation report (SER). The NRC should include a statement (in the technical specifications in the SER) that refers the reader to the SAR and applicable SERs for any alternatives to the codes if not already included in the technical specifications. In addition, the applicant should identify other codes and standards applied to SSCs important to safety in the SAR and should include the same in the technical specifications. Figure 17-1 presents an example of a technical specification provision for allowing alternatives to applicable codes.

#.#.# Codes and Standards
The ASME B&PV Code, Section III, is the governing code for the storage system.

#.#.#.# Design Alternatives to Codes, Standards, and Criteria
SAR Table #-# lists all approved alternatives for the design of the DSS or DSF.

#.#.#.# Construction and Fabrication Alternatives to Codes, Standards, and Criteria
Proposed alternatives to the ASME B&PV Code, Section III, including alternatives referenced in Section [XXX], may be used when authorized by the Director of the Office of Nuclear Material Safety and Safeguards or designee.

The proposal to the NRC must demonstrate that the alternatives would provide an acceptable level of quality and safety, or that compliance with the specified requirements of the ASME B&PV Code, Section III, would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Figure 17-1 Example of a Provision for Allowing Alternatives to Applicable Codes

In addition, acceptance criteria for design features include specifications important to criticality safety. The applicant should ensure that the assemblies' active fuel length remains within the storage container region when required for criticality analyses. One common method is the installation of fuel spacers, upper or lower spacers, as needed, to maintain the assemblies' position under all credible conditions. The minimum boron-10 content of the solid neutron absorbers is another important design feature specification, together with the qualification and acceptance-testing method for ensuring that the neutron absorbers meet the required minimum boron-10 content throughout the absorber material. The proximity of fuel assemblies to each other also affects the storage container's reactivity, generally with reactivity increasing as the assemblies are brought closer together. Therefore, the applicant may specify a minimum dimension(s) between adjacent assembly locations. This dimension may be a minimum flux trap width or a minimum fuel cell pitch. The applicant should also include these design parameters and requirements in the technical specifications.

Additional DSS or DSF design features specifications that may need to be included in the technical specifications include items such as the following:

- important time and other limits associated with draining and drying of the storage container
- systems or features used for corrosion protection of the storage containers
- parameters of features needed for container cooling or combustible gas monitoring
- parameters and controls for features and SSCs related to shielding or radiation protection (e.g., use of shield berms or walls for compliance with 10 CFR 72.104, "Criteria for radioactive materials in effluents and direct radiation from an ISFSI or MRS," or 10 CFR 72.106, "Controlled area of an ISFSI or MRS," limits, and requirement for maintenance, including categorization as important to safety)

- site feature parameters to ensure adequate performance of shielding and other functions during different operations configurations for normal, off-normal, and accident conditions (e.g., minimum distances between loaded storage containers and adjacent construction operations (to expand the storage container array) that removes or exposes materials relied on for shielding, use, characteristics)

- unique features and operations characteristics and actions needed for those features to ensure adequate shielding and radiation protection of the public or personnel for different SSCs and operations (e.g., significant supplemental shielding components that are necessary to ensure adequate shielding of personnel during storage container loading operations and restrictions on personnel when such supplemental shielding is not in place), and any needed evaluations for such features and operations for possible operations configurations under normal, off-normal, and accident conditions

- other site parameters and features related to limits of the use of a DSS such as seismic and environmental characteristics

17.4.5 Administrative Controls

Administrative controls should include the organizational and management procedures, recordkeeping, review and audit systems, and reporting necessary to ensure that the DSS or DSF is managed and operated in a safe and reliable manner. Administrative action that must be taken in the event of noncompliance with a limit or condition should be specified.

Administrative controls also should include programs that are needed to address the following items:

- the requirements in 10 CFR 72.44(d) for a DSF

- safe DSS or DSF operations and handling of storage containers (e.g., storage container transport program, lifting (height) or handling parameter limits, as appropriate)

- radiological environmental monitoring program requirements and effluent control program requirements

- envelope of site characteristics for which the DSS has been evaluated, as needed (e.g., design-basis earthquake)

- operating limits (e.g., temperatures restrictions for handling or transport operations, as applicable)

- radiation protection program requirements (e.g., dose rate limits, evaluations, dose rate measurement procedures for verifying limit compliance

17.5 Review Procedures

The technical specifications define the conditions that are deemed necessary for safe DSS or DSF fabrication and operation. Specifically, they define operating limits and controls, monitoring instruments and control settings, surveillance requirements, design features, and administrative controls and programs that ensure safe operation of the DSS or DSF. As such, the DSF license or DSS CoC, as appropriate, includes technical specifications. Ensure that each specification is

clearly documented and justified in the technical evaluation sections of the SAR and the associated SER, as necessary, and adequate to ensure safe DSS or DSF operation. With respect to a DSF, the scope includes the whole ISFSI or MRS.

If a reviewer determines that a design feature, content specification, analytical assumption, operating assumption, limiting condition of operation, or other SAR item is important and should not be changed without NRC staff approval, then that item should be further evaluated and considered as a potential technical specification. For example, the reviewer should consider safety margins, operational experience design novelty, and other issues that are unique to each proposed design. The reviewer should also implement the guidance in this chapter for establishing such conditions and technical specifications in the facility license or CoC. Figure 17-2 presents an overview of the evaluation process and can be used as a guide to assist in coordinating among review disciplines.

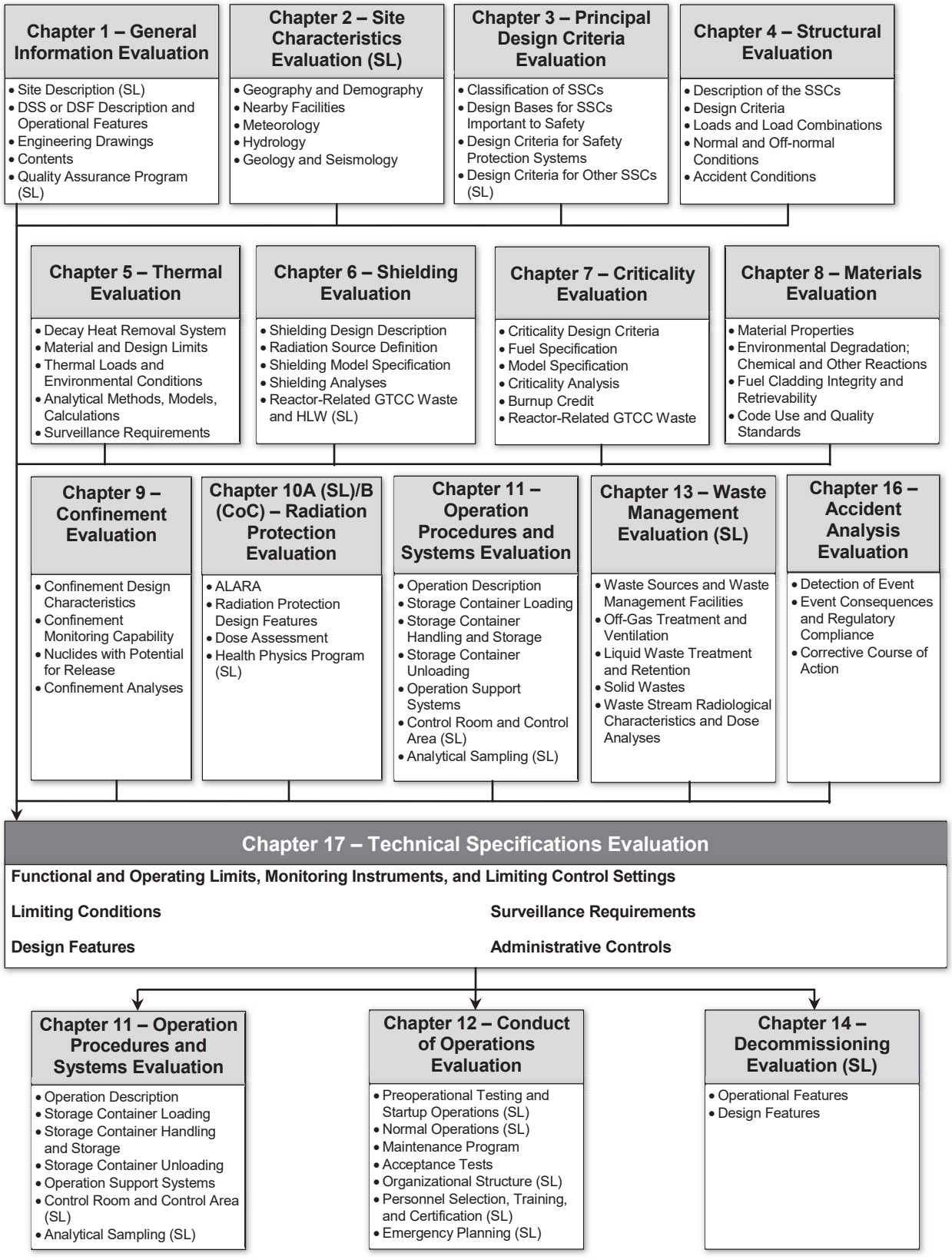

Figure 17-2 Overview of Technical Specifications Evaluation

The NRC staff should evaluate each chapter of the SAR with a goal of establishing the technical specifications or identifying those things that may need technical specifications. The variability of designs and operations makes it impossible to define each instance for which a technical specification is necessary. For this reason, it is important to conduct a coordinated, detailed, and thorough evaluation of each technical section of the SAR. Note all instances in which the SAR either makes an assumption or imposes a condition that should be identified as a technical specification. Note any instances in which the SAR requests alternatives or other conditions that are identified as an operational limit or condition. Such code alternatives should be clearly identified and documented in the SAR chapter on technical specifications.

The various technical disciplines should review the results of their specific evaluations and compare their list of technical specifications to those the applicant identified. The NRC staff should ensure that the conditions for use, as evaluated and approved by the technical reviewers, complement one another and are not contradictory. In addition, the staff will coordinate the resolution of any disputed condition, limit, or specification and is responsible for identifying any unique specifications (e.g., administrative) that may not be covered in the technical sections, although input may be solicited from the technical reviewers regarding any topic.

Become familiar with the technical specifications of similar DSS or DSF designs the NRC staff has previously approved. Note that for a specific license the maximum quantity of SNF, HLW and reactor related GTCC waste is a condition of the license and not included in the technical specifications. For example, the staff has previously approved DSS designs and issued technical specifications regarding a variety of items including, but not limited to, the following examples:

- general requirements and conditions regarding site-specific parameters, operating procedures, quality assurance, heavy loads, training

- preoperational training exercises and demonstrations of most operations, including loading, sealing, and drying (using mockups as appropriate); placement of a storage container on the storage pad; and return of fuel to the SNF pool

- specifications for the SNF to be stored, including, but not limited to, the type of SNF (i.e., boiling-water reactor, pressurized-water reactor, or both), the minimum and maximum allowable enrichments of the fuel before irradiation, burnup (i.e., megawatt days per metric ton uranium), the minimum acceptable cooling time of the SNF before storage, the maximum heat designed to be dissipated, the maximum SNF loading limit, condition of the SNF (i.e., intact assembly or consolidated fuel rods, allowable cladding condition), associated nonfuel hardware, and physical parameters (e.g., length, width, depth, weight). The reviewer should be aware that the technical specifications that rely on burnup credit will need to include additional SNF specifications regarding operational history parameters (e.g., minimum burnup vs enrichment, moderator temperature, in-core soluble boron concentrations, and operations under control rod banks or with control rod insertion)

- as applicable for a specific license, appropriate specifications of the reactor-related greater-than-Class-C (GTCC) waste and high-level radioactive waste (HLW) to be stored, such as waste chemical and physical form, radionuclide characteristics, and heat generation rates (some of this information may be included in either the technical specifications or a separate license condition)

- criticality controls, such as storage container water boron concentrations, minimum flux trap and fuel cell pitch, use of fuel spacers, minimum neutron absorber boron-10 loading, and neutron absorber acceptance tests and qualification program
- the inerting atmosphere requirements during vacuum drying and helium backfill parameters
- handling restrictions, such as lift height limits and operational temperature limit (high-low) conditions
- storage container confinement barrier requirements, such as helium leak rate limits
- thermal performance parameters, such as maximum temperatures or delta-temperatures
- radiological controls such as operational (SSC surface) radiation dose rate and contamination limits and conditions regarding design parameters, operations, and programmatic controls that affect offsite doses
- storage array and spacing limits, as appropriate, for thermal performance and radiological considerations
- definition of damaged fuel
- fabrication and design codes and alternatives to specific code requirements
- specifications or requirements for alternative materials for important-to-safety SSCs
- manufacture and testing of neutron poison material(s) for criticality control
- hydrogen monitoring and mitigation, as appropriate, during wet loading and unloading
- maintaining inert atmosphere during and after storage container draining or flooding to prevent oxidation.
- use of copper-bearing or weathering steel for structural steel components at coastal marine DSF sites or for DSSs (or other corrosion mitigation measures)
- operational controls to maintain cladding temperature limits
- low-temperature ductility of ferritic steels
- testing of design features and procedures that are significant to radiation protection and environmental releases
- minimum distance between loaded storage containers and construction activities that would disturb (remove, or expose) materials relied on for shielding for the loaded container
- requirements for active systems that may be used to ensure safety performance of the storage container (e.g., active corrosion protection system for the storage configuration, active supplemental cooling system during transfer operations)

All disciplines should coordinate their review of the proposed technical specifications to ensure the operational limitations are measurable and inspectable. Other topics may include the following:

- frequency and scope proposed for the surveillance requirements
- administrative controls that include organization and administrative systems and procedures, recordkeeping, review, and audit systems required to ensure that the DSS or DSF is managed in a safe and reliable manner, not already required by regulation
- action(s) that must be taken in the event of noncompliance with a limit or condition

Identify any additional technical specifications deemed necessary using the recommended format from RG 3.62 and RG 3.48.

For a DSS, NUREG-1745 provides a recommended format for applicants to present proposed technical specifications and certificate conditions. However, this format may not be applicable to all technical specifications. Since the basis for a technical specification may be extensively discussed in earlier chapters of the SAR, the applicant may use an abbreviated format of the basis discussion in the technical specifications chapter of the SAR.

Ensure that all necessary technical specifications are explicitly delineated in the SER chapter on the technical specifications and in the technical specifications accompanying the DSF facility license or DSS CoC. These delineations typically restate the technical specifications defined in the SAR but may be modified or supplemented, as the staff deems appropriate. Ensure that the SER and technical specifications clearly identify and document the code alternatives the applicant requested. The staff may prepare a separate table or appendix to the SER, as needed, to explicitly designate the technical specifications that are applicable to the DSS or DSF.

This evaluation is based on information that the applicant presented in the SAR chapter on technical specifications; accepted practices; and the applicant's analyses, design, and operations descriptions discussed in the SAR or in correspondence with the NRC subsequent to submission of the application. Describe in the SER any additional operating controls and limits that are deemed necessary and add, as appropriate, to the DSS's or DSF's CoC or license conditions or accompanying technical specifications.

17.6 Evaluation Findings

The NRC reviewer should prepare evaluation findings on satisfaction of the regulatory requirements in Section 17.4 of this SRP. This section also lists evaluation findings developed or included in all SER sections relating to technical specifications. With respect to a DSF, the findings should cover the whole facility, including specifications related to the proposed storage of any HLW (MRS only) and reactor-related GTCC waste at the facility. In addition, the findings should include a listing of any additional technical specifications that the NRC staff identified as necessary (beyond those identified by the applicant). If the documentation submitted with the application fully supports positive findings for each of the regulatory requirements, the statements of finding should be similar to the following:

F17.1 The staff concludes that the conditions for [DSS/DSF name] identify necessary technical specifications to satisfy 10 CFR Part 72 and that the applicable acceptance criteria have been satisfied.

F17.2 [if applicable] In addition to the applicant's proposed technical specification(s), the staff finds that the technical specification(s) added by the NRC is/are required for safe operation.

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

The applicant's proposed technical specifications and the technical specifications specified by the NRC provide reasonable assurance that the DSS or DSF will allow for the safe storage of spent fuel, and (as applicable for the (list site specific license)) reactor-related GTCC waste and HLW. This finding is reached on the basis of a review that considered the regulation itself, appropriate regulatory guides, applicable codes and standards, accepted practices, and the statements and representations in the application.

17.7 References

10 CFR Part 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater Than Class C Waste."

American Society of Mechanical Engineers (ASME), Boiler and Pressure (B&PV) Code, 2007 –Addenda 2008.
Section III, "Rules for Construction of Nuclear Facility Components."

NUREG-1745, "Standard Format and Content for Technical Specifications for 10 CFR Part 72 Cask Certificates of Compliance," issued June 2001 (Agencywide Documents Access and Management System Accession No. ML011940387).

Regulatory Guide 3.48, "Standard Format and Content for the Safety Analysis Report for an Independent Spent Fuel Storage Installation or Monitored Retrievable Storage Installation (Dry Storage)."

Regulatory Guide 3.61, "Standard Format and Content for a Topical Safety Analysis Report for a Spent Fuel Dry Storage Cask."

Regulatory Guide 3.62, "Standard Format and Content for the Safety Analysis Report for Onsite Storage of Spent Fuel Storage Casks."