

DG-1145: Combined License Applications for Nuclear Power Plants (LWR Edition)



Office of Nuclear Reactor Regulation
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Section C.I.5, Reactor Coolant System and Connected Systems

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Technical Branch

SRP Section

- | | |
|---|---|
| • Engineering Mechanics (EEMB) | [5.2.1.1, 5.2.1.2] |
| • BWR Systems (SBWB) | [5.2.2.5, 5.4.5, 5.4.6, 5.4.7, 5.4.12] |
| • PWR Systems (SPWB) | [5.2.2.5, 5.4.5, 5.4.7, 5.4.11, 5.4.12] |
| • Piping & NDE (CPNB) | [5.2.3, 5.2.4, 5.4.8] |
| • Balance-of-Plant (SBPB) | [5.2.5] |
| • Vessels & Internals Integrity (CVIB) | [5.3.1, 5.3.2, 5.3.3] |
| • Flaw Evaluation & Welding (CFEB) | [5.4.1.1] |
| • SG Tube Integrity & Chemical Eng (CSGB) | [5.4.2.1, 5.4.2.2] |

Section C.I.5, Reactor Coolant System and Connected Systems

COL Application Final Safety Analysis Report (FSAR)

Chapter 5 of FSAR:

- Reactor coolant system (RCS) and systems to which it connects
- RCS and pressure-containing appendages out to and including isolation valving which is the “reactor coolant pressure boundary” (RCPB) as defined in 10 CFR 50.2(v)
- Evaluations, with necessary supporting material, should demonstrate
 - Adequate to accomplish intended objective(s)
 - Maintain integrity under normal and accident conditions
- Information sufficient to permit independent determination that evaluations are correct and complete and all necessary evaluations have been performed

Section C.I.5, Reactor Coolant System and Connected Systems

COL Applications Referencing a Certified Design or Certified Design & Early Site Permit

- C.III.1, Chapter 5, Reactor Coolant System & Connected Systems
 - Additional information needed for application referencing CD
 - Topics for which additional information is needed are identified by [*] on the following slides
- C.III.2, Chapter 5, Reactor Coolant System & Connected Systems
 - Additional information needed for application referencing CD & ESP
 - Note: needed information is identical to that identified in C.III.1, Chapter 5

Section C.I.5, Reactor Coolant System and Connected Systems

5.1 Summary Description

5.1.1 Schematic Flow Diagram

5.1.2 Piping and Instrumentation Diagram

5.1.3 Elevation Drawing

5.2 Integrity of Reactor Coolant Pressure Boundary

5.2.1 Compliance with Codes and Code Cases

5.2.1.1 Compliance with 10 CFR 50.55a [SRP 5.2.1.1]

5.2.1.2 Applicable Code Cases [SRP 5.2.1.2]

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5.2.2 Overpressure Protection [SRP 5.2.2]

5.2.2.1 Design Bases

5.2.2.2 Design Evaluation

5.2.2.3 Piping and Instrumentation Diagrams

5.2.2.4 Equipment and Component Description

5.2.2.5 Mounting of Pressure-Relief Devices

5.2.2.6 Applicable Codes and Classification

5.2.2.7 Material Specification

5.2.2.8 Process Instrumentation

5.2.2.9 System Reliability

5.2.2.10 Testing and Inspection [*]

Section C.I.5, Reactor Coolant System and Connected Systems

5.2.3 RCPB Materials [SRP 5.2.3]

5.2.3.1 Material Specifications

5.2.3.2 Compatibility with Reactor Coolant [*]

5.2.3.3 Fabrication and Processing of Ferritic Materials

5.2.3.4 Fabrication and Processing of Austenitic Stainless Steels

5.2.3.5 Prevention of PWSCC for Nickel-Based Alloys (PWRs only)

5.2.4 Inservice Inspection and Testing of RCPB [SRP 5.2.4]

5.2.4.1 Inservice Inspection and Testing Program [*]

5.2.4.2 Preservice Inspection and Testing Program [*]

5.2.5 RCPB Leakage Detection [SRP 5.2.5]

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5.3 Reactor Vessels

5.3.1 Reactor Vessel Materials [SRP 5.3.1]

5.3.1.1 Material Specifications

5.3.1.2 Special Processes for Manufacturing & Fabrication

5.3.1.3 Special Methods for Nondestructive Examination

5.3.1.4 Special Controls for Ferritic and Austenitic Stainless
Steels

5.3.1.5 Fracture Toughness

5.3.1.6 Material Surveillance [*]

5.3.1.7 Reactor Vessel Fasteners

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5.3.2 Pressure-Temperature Limits, PTS, ... [SRP 5.3.2]

5.3.2.1 Limit Curves

5.3.2.2 Operating Procedures [*]

5.3.2.3 Pressurized Thermal Shock (PWRs only)

5.3.2.4 Upper Shelf Energy

5.3.3 Reactor Vessel Integrity [SRP 5.3.3]

5.3.3.1 Design

5.3.3.2 Materials of Construction

5.3.3.3 Fabrication Methods

5.3.3.4 Inspection Requirements [*]

5.3.3.5 Shipment and Installation [*]

5.3.3.6 Operating Conditions [*]

5.3.3.7 Inservice Surveillance [*]

5.3.3.8 Threaded Fasteners

Section C.I.5, Reactor Coolant System and Connected Systems

5.4 Component and Subsystem Design [SRP 5.4]

- Address each principal component or subsystem
- Provide respective design bases, description, evaluation, and tests and inspections
- Provide separate subsections (5.4.1 through 5.4.n) appropriate to specific reactor type and design
- Note: certain subsections in guidance may be “not applicable” and additional subsections may be necessary
e.g., Core Makeup Tanks, Automatic Depressurization System
Valves, Passive Residual Heat Removal Heat Exchanger, Isolation
Condenser System, Gravity-Driven Cooling System

Section C.I.5, Reactor Coolant System and Connected Systems

5.4.1 Reactor Coolant Pumps

5.4.1.1 Pump Flywheel Integrity (PWR) [SRP 5.4.1.1]

5.4.2 Steam Generators (PWR)

5.4.2.1 Steam Generator Materials [SRP 5.4.2.1] [*]

5.4.2.2 Steam Generator Tube Integrity Program [SRP 5.4.2.2] [*]

5.4.3 Reactor Coolant Piping

5.4.4 [Reserved]

5.4.5 [Reserved]

5.4.6 Reactor Core Isolation Cooling System (BWR) [SRP 5.4.6]

5.4.6.1 Design Bases

5.4.6.2 System Design

5.4.6.3 Performance Evaluation

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5.4.7 Residual Heat Removal System [SRP 5.4.7]

5.4.7.1 Design Bases

5.4.7.2 System Design

5.4.7.3 Performance Evaluation

5.4.8 Reactor Water Cleanup System (BWR) [SRP 5.4.8]

5.4.8.1 Design Bases

5.4.8.2 System Description

5.4.8.3 Performance Evaluation

5.4.9 [Reserved] – Isolation Condenser System

5.4.10 [Reserved]

Section C.I.5, Reactor Coolant System and Connected Systems

5.4.11 Pressurizer Relief Tank (PWR) [SRP 5.4.11]

5.4.11.1 Design Bases

5.4.11.2 System Description

5.4.11.3 Performance Evaluation

5.4.11.4 Instrumentation

5.4.12 Reactor Coolant System High Point Vents [SRP 5.4.12]

5.4.12.1 Design Bases

5.4.12.2 System Design

5.4.12.3 Performance Evaluation

5.4.13 [Reserved]

5.4.14 [Reserved]

Section C.I.6, Engineering Safety Features

- Technical basis
- Referencing a certified design as a COL applicant
- Pre-Workshop Comments
- Q&A

Section C.I.6, Engineering Safety Features

Technical basis:

- Regulatory Guide 1.70, Rev. 3, Nov. 1978
- ABWR, System 80+, AP1000/600, (ESBWR) Reviews
- Standard Review Plan

Section C.I.6

COL Applications Referencing a Certified Design (Section C.III.1, Chapter 6)

Note: COL applicants need to provide additional information for topics identified by [*] on the following slides

Section C.I.6, Engineering Safety Features

6.1 Engineered Safety Feature Materials*

- 6.1.1 Metallic Materials
 - 6.1.1.1 Materials Selection and Fabrication*
(Re-looking at this)
 - 6.1.1.2 Composition and Compatibility of Core Cooling Coolants and Containment Sprays*
- 6.1.2 Organic Materials*

Section C.I.6, Engineering Safety Features

6.2 Containment Systems

- 6.2.1 Containment Functional Design
- 6.2.2 Containment Heat Removal Systems.
- 6.2.3 Secondary Containment Functional Design
- 6.2.4 Containment Isolation System
- 6.2.5 Combustible Gas Control in Containment
- 6.2.6 Containment Leakage Testing*
 - 6.2.6.1 Containment integrated Leakage Rate Test*
 - 6.2.6.2 Containment Penetration Leakage Rate Test*
 - 6.2.6.3 Containment Isolation Valve Leakage Rate Test*
 - 6.2.6.4 Scheduling and Reporting of Periodic Tests*
 - 6.2.6.5 Special Testing Requirements*
- 6.2.7 Fracture Prevention of Containment Pressure Vessel

Section C.I.6, Engineering Safety Features

- 6.3 Emergency Core Cooling System*
- 6.4 Habitability Systems
- 6.5 Fission Product Removal and Control Systems
 - 6.5.1 ESF Filter Systems
 - 6.5.2 Containment Spray Systems
 - 6.5.3 Fission Product Control Systems and Structures
 - 6.5.4 Ice Condenser as a Fission Product
 - 6.5.5 Pressure Suppression Pool as a Fission Product
Cleanup System

Section C.I.6, Engineering Safety Features

- 6.6 In-service Inspection of Class 2 and 3
Components*
 - 6.6.1 Components Subject to Examination
 - 6.6.2 Accessibility
 - 6.6.3 Examination Techniques and Procedures*
 - 6.6.4 Inspection Intervals*
 - 6.6.5 Examination Categories and Requirements*
 - 6.6.6 Evaluation of Examination Results*
 - 6.6.7 System Pressure Tests*
 - 6.6.8 Augmented In-service Inspection to Protect
Against Postulated Piping Failures*

Section C.I.6, Engineering Safety Features

6.7 Main Steam Line Isolation Valve
Leakage Control Steam (BWRs)

6.8 Reactor Coolant Depressurization System
(PWR)

- Incorrectly included in C.III.1. This section is not included in C.I.6. Staff is still determining the need for this.

Pre-workshop Questions/Comments

- **We have not yet formally addressed the pre-workshop questions and comments**
 - Staff may be able to discuss them now
- **Q&A Session on:**
 - Pre-workshop comments
 - Section C.I.6
 - Section C.III.1, Chapter 6
 - Section C.III.2, Chapter 6