Design and Procurement Specification Development Schedule

- Introduction
- NSSS Design Specifications
- BOP Design Specifications
- Open Discussion

Introduction

Purpose of Meeting

- **To provide the status of design specification preparation**
  - NSSS Design Specifications
  - Balance of Plant (BOP) Design Specifications

- **To discuss the scope and level of detail to meet 10 CFR 52.47 design completion requirements**
  - “Can be prepared” approach
  - Preparing the design and procurement specifications

- **To discuss the timeline to develop required specification for audit**

NSSS Design Specifications

Status of Design Specifications Preparation for NSSS Systems and Components (1/3)

- KHNP has prepared all design specifications for NSSS systems and components. Design specifications for major components are listed as below.

Title	ASME Class	System	Remark
Design Specification for Reactor Vessel Assembly	1	RCS	
Design Specification for Pressurizer Assembly	1	RCS	
Design Specification for Steam Generator Assembly	1	RCS	
Design Specification for Reactor Coolant Pipe and Fittings	1	RCS	
Design Specification for The Integrated Head Assembly	1&3&NNS	IHA	
Design Specification for Reactor Vessel Support Assemblies	1	RCS	
Design Specification for Fuel Handling System Equipment	NNS	FHS	
Design Specification for the ICI Guide Tubes and Guide Tube Supports	1	RCS	
Design Specification for Reactor Vessel Core Support and Internal Structures	CS	RCS	
Design Specification for Reactor Coolant Pump Supports	1	RCS	
Design Specification for Reactor Internals Lift Rig Assembly	N/A	RCS	
Design Specification for the In-core Instrument Assemblies	1	ICI	
Design Specification for Steam Generator Single Nozzle Dams	1	RCS	

Status of Design Specifications Preparation for NSSS Systems and Components (2/3)

Title	ASME Class	System	Remark
Design Specification for a Gas Stripper	NNS	CVCS	
Design Specification for Regenerative Heat Exchanger	2	CVCS	
Design Specification for Shutdown Cooling Pump Mini-flow Heat Exchanger	2&3	SCS	
Design Specification for Shutdown Cooling Heat Exchanger	2&3	SCS	
Design Specification for Centrifugal Charging Pump	3	CVCS	
Design Specification for Auxiliary Charging Pump	3	CVCS	
Design Specification for Volume Control Tank	3	CVCS	
Design Specification for Safety Injection Pump	2	SIS	
Design Specification for Shutdown Cooling Pump	2	SCS	
Design Specification for Reactor Coolant Pumps	1	RCS	
Design Specification for Reactor Coolant Pump Motors	NNS	RCS	
Design Specification for Pressurizer Pilot Operated Safety Relief Valves	1	RCS	
Design Specification for Letdown Heat Exchanger	2&3	CVCS	
Design Specification for Safety Injection Tank	2	SIS	

Status of Design Specifications Preparation for NSSS Systems and Components (3/3)

Title	ASME Class	System	Remark
Design Specification for Check Valves Greater Than Two Inches	1&2&3&NNS	RCS/SIS/ CVCS	
Design Specification for Solenoid Operated Valves	1&2&3	RCS/SIS/ CVCS	
Design Specification for Motor Operated Valves	1&2&3&NNS	RCS/SIS/ SCS/CVCS	
Design Specification for Manual Valves	1&2&3&NNS	RCS/SIS/ SCS/CVCS	
Design Specification for Pneumatic Operated Valves	1&2&3&NNS	RCS/SIS/ SCS/CVCS	
Design Specification for Nuclear Service Pressure Regulators	NNS	CVCS	
Design Specification for RTD Thermowells	1&2	RCS/SIS/ SCS/CVCS	
Design Specification for a Boric Acid Concentrator	NNS	CVCS	
Design Specification for Orifices	2	CVCS	

Contents of Design Specifications for NSSS Systems and Components (1/2)

❖ Typical Design Specification for Motor Operated Valves

Section	Title	Section	Title
1.0	**Scope**	5.6	Documents Required to Be Submitted for Approval Prior to Fabrication Release
1.1	General		
1.2	Contract Participants	5.7	Documents Required to Be Submitted for Approval Prior to Release for Shipment
1.3	Works Included		
1.4	Interface Equipment and Services	5.8	Documents Required to Be Submitted for Information Prior to Release for Shipment
2.0	**Abbreviations and Definitions**	5.9	Documents Not Submitted but Available for Review in Supplier's Shop
2.1	Design Product Level		
2.2	Abbreviations	5.10	Documents to Be Presented/Submitted to the Purchaser by the Supplier at the Time of Final Inspection
3.0	**Applicable References**		
3.1	Purchaser's Specification	**6.0**	**Design Requirements**
3.2	Codes	6.1	General Requirements
3.3	Standards	6.2	Enviromental Conditions
3.4	Others	6.3	Seismic Requirements
3.5	Conflicts	6.4	Detailed Design Requirements
4.0	**Quality Stanards**	**7.0**	**Material Requirements**
4.1	Quality Class Classification		
4.2	Quality Assurance Requirements	**8.0**	**Inspection and Testing**
		8.1	Inspection Requirements
5.0	**Submittals**	8.2	Test Requirements
5.1	General Requirements		
5.2	Drawings and Documents	**9.0**	**Cleaning and Painting**
5.3	Instruction Manuals and Technical Documents	9.1	cleaning Requirements
5.4	Documents to Be Submitted with Proposal	9.2	Painting Requirements
5.5	Documents Required to Be Submitted for Approval prior to Material Release	**10.0**	**Identification**

Contents of Design Specifications for NSSS Systems and Components (2/2)

Section	Title	Section	Title
11.0	**Packaging, Shipping and Preparation for Storage**		
11.1	Packaging and Shipping Requirements	11.2	Preparation for Storage Requirements
Appendices			
A	Outline/Interface Drawing Requirements	G	Valve List Susceptible to Pressure Locking and Thermal Binding
B	Valve Operating Transients Data		
C	Valve-to-Piping Weld End Connections	H	Non-Seismic Data
D	Painting Class and Finish Color	I	Weak Link Analysis for Gate/Globe Valves
E	Valve Environmental Requirements	J	Valve Data sheet Headings
F	Safety Related Mov List Subject to USNRC Generic Letter 89-10	K	Valve Data sheets
		L	Required Input motion(RIM) Curves for Seismic Category I&II Valves

BOP Design Specifications

Status of BOP Specifications

❖ **Design specifications that have been prepared**

- Piping System Design Specification (PSDS) for primary support systems (See Table 1)
  - RCS, SI/SC, CCW, ESW, etc.
- PSDS for secondary systems
  - Main Feedwater, Main Steam (under preparation)
  - PSDSs for non-safety related systems that penetrate containment building are not prepared

❖ **Procurement and construction specifications are not prepared.**

Table 1. List of Prepared BOP Design Specifications

- KHNP has prepared design specifications for BOP piping systems as below

Title	ASME Class	Remark
General PSDS	1, 2 & 3	Piping System Design Specification (PSDS)
Reactor Coolant System (RCS)	1, 2 & 3	
Reactor Coolant Gas Vent System (RCGVS)	1, 2 & 3	
Safety Injection/Shutdown Cooling System (SIS/SCS)	1, 2 & 3	
Containment Spray System (CSS)	2 & 3	
Incontainment Refueling Water Storage System (IRWS)	2	
Chemical Volume Control System (CVCS)	1, 2 & 3	
Steam Generator Blowdown System (SGBDS)	2	
Component Cooling Water System (CCWS)	2 & 3	
Essential Service Water System (ESWS)	3	
Spent Fuel Pool Cooling and Cleanup System (SFPCCS)	2 & 3	
Gaseous Radwaste System (GRS)	2	
Radioactive Drain System (RDS)	2	
Primary Sampling System (PSS)	2 & 3	
Main Feedwater System (FWS)	2	
Main Steam System (MSS)	2	Under Preparation

Typical Contents of Piping System Design Specification (1/3)

Division	Title	Remark
Division 1 – General Requirements		
101	Name of Project	
102	Owner	
103	ASME B&PV Code, Section III Certificate Holder	
104	Location of Project	
105	Definitions	
106	Scope of Design Specification	
Division 2 – Supplements, Standards, and Drawings		
201	Supplements	PDT, Seismic Report, DBD, etc.
202	Standards	
203	Drawings	
204	Attachments	
Division 3 – Function, Classification, and Code		
301	System Function and Boundary	
302	Code Classification	
303	Effective Code Edition, Addenda, and Code Case to be used for Construction	
304	Certification of Design Specification	
305	Identification of Enforcement Authority	
306	Provision of Design Specification	
307	Review of Design Report	
308	Permanent Records	

Typical Contents of Piping System Design Specification (2/3)

Division	Title	Remark
Division 4 – Design Basis and Service Limits		
401	Plant Conditions and System Service Limits	
402	Design Loads	
403	Thermal and Pressure Loads	
404	Test Loads	
405	Seismic Loads	
406	Dynamic Loads	
407	Peak Pressure	
408	Load Combinations	
409	Deflection/Deformation Limits	
410	Pipe Hangers	
411	Design for Accessibility	Accessibility for inspection
Division 5 – Materials		
501	General Requirements	
502	Impact Testing	
503	Acceptable Materials	
Division 6 - Fabrication		
601	General Requirements	
602	Handling, Storage, and Shipping	

Typical Contents of Piping System Design Specification (3/3)

Division	Title	Remark
Division 7 – Testing		
701	Pneumatic Testing	
702	Hydrostatic Tests	
703	Bellows-type Expansion Joints	
704	Leak-tightness	
705	Additional Testing	
Division 8 – Protection Against Overpressure		
801	General requirements	
802	Design Secondary Pressure	
803	Maximum Anticipated Pressure and Temperature	
804	Pressure Relief Valve Operating Requirements	
805	Pressure Relief Valve Operating Characteristics	
Division 9 – Operability		
901	General Requirements	
902	Functional Capability	
Division 10 – Pipe Rupture & Jet Impingement		
1001	General Requirements	
1002	Crack Exclusion criteria for Moderate Energy Piping	
Attachments		
1	Thermal/Pressure Mode Diagram	

Approaches for Meeting the "Design Completion" Requirements of 10 CFR 52.47

- **Two ways to meet the design completion requirements.**
  - "Can be prepared" approach
  - Preparing the design and procurement specifications

“Can be Prepared” Approach

- **Enough design information is available that can support the preparation of design and procurement specification.**

  - Classification Criteria
  - System Design Criteria (SDC)
  - System Functional Descriptions (SFD)
  - System Design Calculations
  - GA and various DBDs’
  - P&IDs’, Piping Layout Drawings and Piping Design Table (PDT)
  - Seismic FRS
  - EQ data
  - Etc.

Preparing the Design and Procurement Specifications

❖ Scope of BOP design and procurement specifications

- Apply graded approach to the selection of systems and components, for which design and procurement specifications are needed to be prepared.
  - NRC guidance on graded approach
  - Design and procurement specifications are required only for Class 1 major components.
  - All design specifications for Class 1 major components have been prepared by the NSSS designer.
- Graded approach is applied to MS and FW systems for Class 2 system.
  - A procurement specification of “Main Steam Isolation Valves and Main Feedwater Isolation Valves” with regard to the major components of MS and FW systems can be prepared for audit by the end of 2015, if required.

Level of Detail of Procurement Specifications

- **Level of detail required for DC design**
  - ASME Code Section III, Division 1 NCA-3250
  - Procurement specifications developed for construction project typically contain too much details

- **ASME Code Section III, NCA-3252 : See slide 24**
  - Functions and boundaries of the components
  - Design requirements including all required overpressure protection requirements
  - Environmental conditions including radiation
  - Code classification of the components
  - Material requirements including impact test requirements
  - Operability requirements
  - Effective Code Edition, Addenda and Code Cases to be used for construction

- **Design information typically contained in the procurement specifications of a construction project**
  - See Table 2 for details

- **Level of detail for DC design**
  - See Table 2 for details

Table 2. Design Information Contained in the Procurement Specification for Construction Project (1/4)

Section	Title	DC Applicability
MAIN BODY		
Section 1	General Conditions	Contract Condition
Section 2	Special Conditions Certification of Specification	
Section 3	Material Description and Pricing Data	
Section 4*	Technical Specification	○
ATTACHMENTS		
4-1	Witness Point	
4-2	Hold Point	
4-3	Data Sheets (if necessary)	○
4-4	Piping Design Table	○
4-5	Building Structure Load Summary Form	
4-6	Response Spectra Curves	○
4-7	Numbering Guidelines for Supplier subsystem and component	
4-8	Drawings	○
APPENDICES		

*Section 4 addresses all information required for NCA-3252 compliance.

Table 2. Design Information Contained in the Procurement Specification for Construction Project (2/4)

❖ Section 4 details

Subsection	Title	Contents	DC Applicability
4.01	Scope	Scope of work to be performed by supplier	○
4.02	Abbreviations and Definitions		○
4.03	Quality Standards	Codes and standards, Quality requirements, Quality Class, etc.	○
4.04	Submittals	Requirements for the submittal of documents	○
4.05	Design Conditions	Design and operation conditions	○
		Dynamic design requirements	○
		Environmental design requirements	○
4.06	Materials and Fabrication	Requirements for fabrication and special process (welding, heat treatment, etc.)	○
4.07	Instrumentation and Control Requirements		○
4.08	Surface preparation and Coating		○
4.09	Nameplates		○
4.10	Inspection and Testing	Test and inspection requirement and acceptance criteria	○
		Quality surveillance and audit requirements	○
4.11	Shipping Requirements	Cleaning, packing, handling, shipping, storage	○
4.12	Instrution Manuals	Requirements for the submittal of instruction manual	○

Table 2. Design Information Contained in the Procurement Specification for Construction Project (3/4)

No.	Appendices	DC Applicability
1	Quality Assurance Program Requirements	○
2	Quality Surveillance Requirements	○
3	General Requirements for Submittal of Documents	○
4	Drawing and document submittal requirements	○
5	Quality verification documentation list	
6	Environmental qualification requirements for nuclear safety related equipment	○
7	Requirements for coating service level I equipment and components	
8	Requirements for coating service level II equipment and components	○
9	Documentation requirements of supplier deviation and nonconformances	
10	Reporting requirements for defects and noncompliance and for significant deficiencies	
11	Dynamic qualification requirements for nuclear safety related equipment	○
12	Examination and testing of ASME Section III piping, fittings and valves	○
13	Welding requirements for ASME Section III items	○
14	Welding requirements for ASME Section VIII items	○
15	Welding requirements for ASME B31.1, Power Piping	○

Table 2. Design Information Contained in the Procurement Specification for Construction Project (4/4)

No.	Appendices	DC Applicability
16	Welding requirements for Structural Steel	
17	Standard specification for alternating current motors - Squirrel cage type	○
18	Standard specificaiton for motors and operating equipment used on valves	○
19	Standard specification for electrical apparatus	○
20	Chemical requirements for materials used in contact with austenitic stainless steel or nickel base alloys	○
21	General Requirements for instrument & control	○
22	Requirements for instrument tagging	
23	Requirements for panel labels	
24	General requirements for vibration transducer	
25	Weld end details	○

Compliance of NCA-3252 Requirements

CERTIFICATION OF SPECIFICATION
ASME Design Specification Requirements Locator
(ASME Sec. III, Div. 1)

	Items	Specification Paragraphs or Reference Documents
1.	Functions and boundaries of the components	4. 05. A. 1 & 2
2.	Design requirements, including all required overpressure protection requirements	4. 05. A, B, C & D 4. 06. A & B
3.	Environmental conditions, including radiation	4. 05. D
4.	Code classification of the components	4. 01. A. 1 4. 06. B. 1
5.	Material requirements, including impact test requirements when applicable	4. 06.C
6.	Operability requirements	4. 05. A & B 4. 10.B.5
7.	Effective Code Edition, Addenda and Code Cases to be used for construction	4. 03. B & F

Timeline for the Development of BOP Procurement Specifications

- Meet NRC's audit plan

Thank You!