
NRC Review of Safety-related Piping and ASME Component Design and Analysis

June 26 and 27, 2007

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Agenda

- Introduction
- Piping Design Finalization and Analysis Process
- Design and Analysis Activities Completed
- Component, Design, Analysis and Fabrication process
- Status of Component Design and Analysis Activities
- Review of Sample Documents, Analysis, and Calculations
- Summary, Actions, and Plans Going Forward

Objectives

- Demonstrate the substantial amount of design and analysis that is complete for piping and ASME components.
- Establish conditions and schedule for an NRC audit of piping and ASME Components
- Define Westinghouse actions needed to support an NRC audit
- Discuss resolution of COL Information Item 3.9-2 and completion of Piping Design Acceptance Criteria (DAC).

Activities Completed

- NRC approval of safety-related piping and ASME component analysis methods during design certification review.
- NRC audit of piping leak-before-break analysis.
- NRC initial audit of core makeup tank and accumulators
- Westinghouse submittal of design summary technical reports to resolve COL Information Item 3.9-2 and close piping DAC.

Closure Resolution

- Resolution of Piping DAC
 - Outline Piping Design and Analysis Process
 - Define status
 - Provide examples
- Closure of COL Information Item 3.9-2
 - Outline Component Design and Analysis Process
 - Define Status
 - Provide examples.

Related Activities

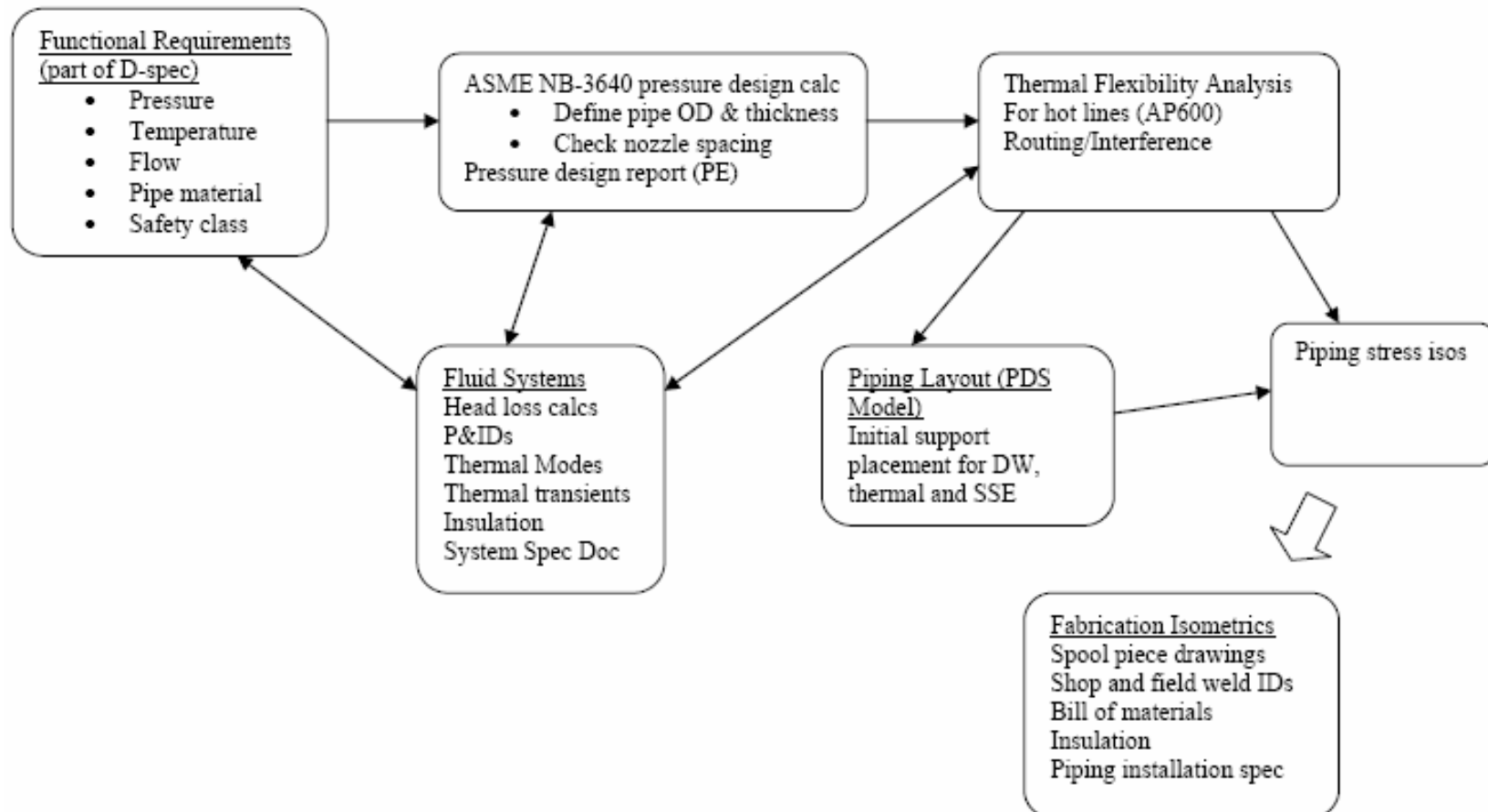
- Resolve questions about design information for valves and other auxiliary components
- Resolve conflict between NRC and ASME Code Section III requirements for applicable edition.

Piping Design and Analysis

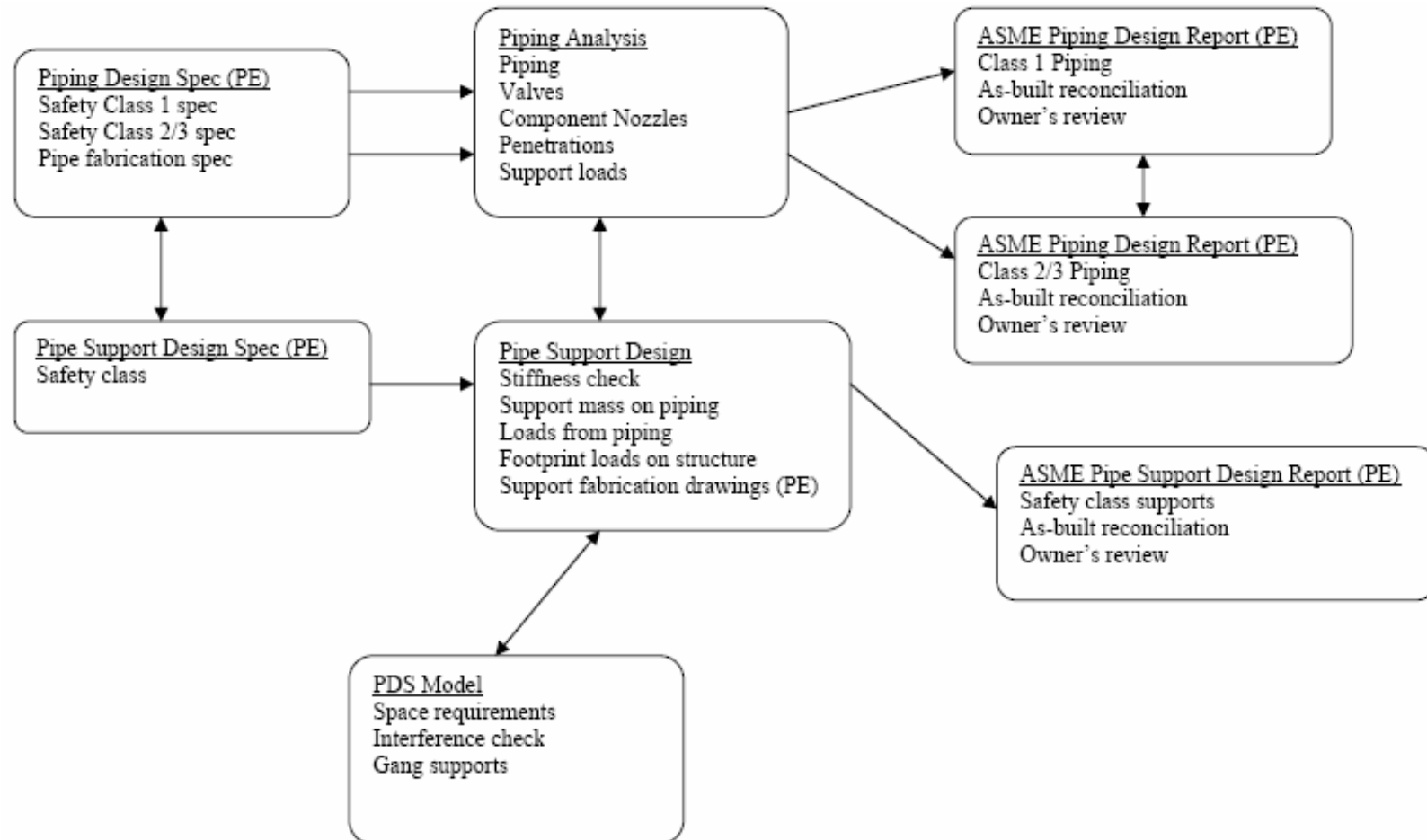
Piping Design Finalization and Analysis Process

- Confirm piping layout
- Prepare Design Specification
- Prepare Piping analysis
- Develop design transients
- Design and locate piping supports
- Prepare Design Reports

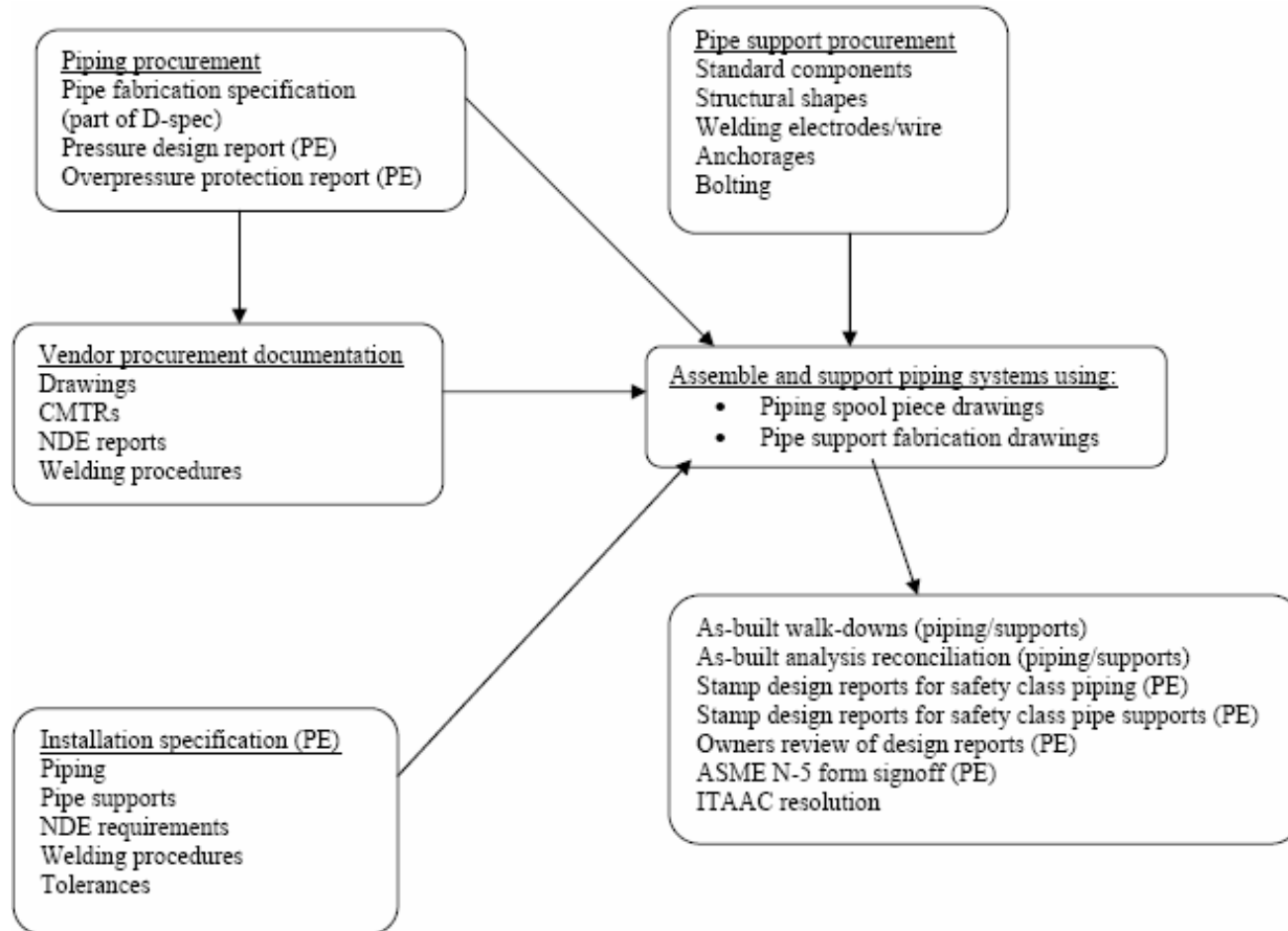
Layout



Pipe/Pipe supports Design/Analysis



Procurement/Installation



Piping Design and Analysis Activities Completed

- Design Specification for safety-related piping
- Reactor Coolant Loop Analysis
- Stress analysis for 11 of 13 ASME Class 1 Lines
- Stress analysis for additional ASME Class 2 and Class 3 lines

Piping Design and Analysis

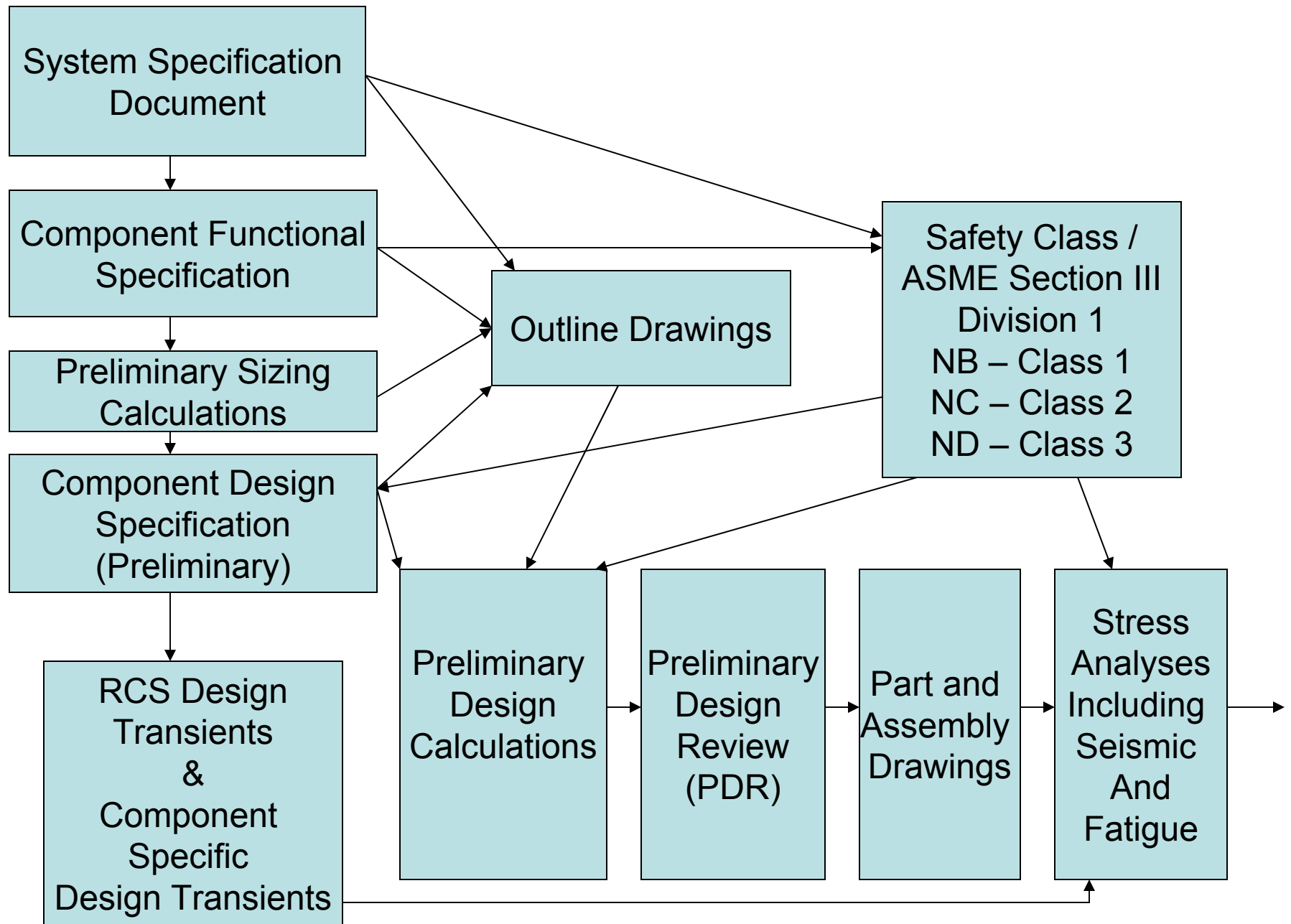
- Completed piping analyses predominantly use Hard Rock Spectra.
- Leak-before-break evaluations completed
- Sample analyses have be completed using extended spectra.
- Fatigue analysis do not drive piping layout or connection design

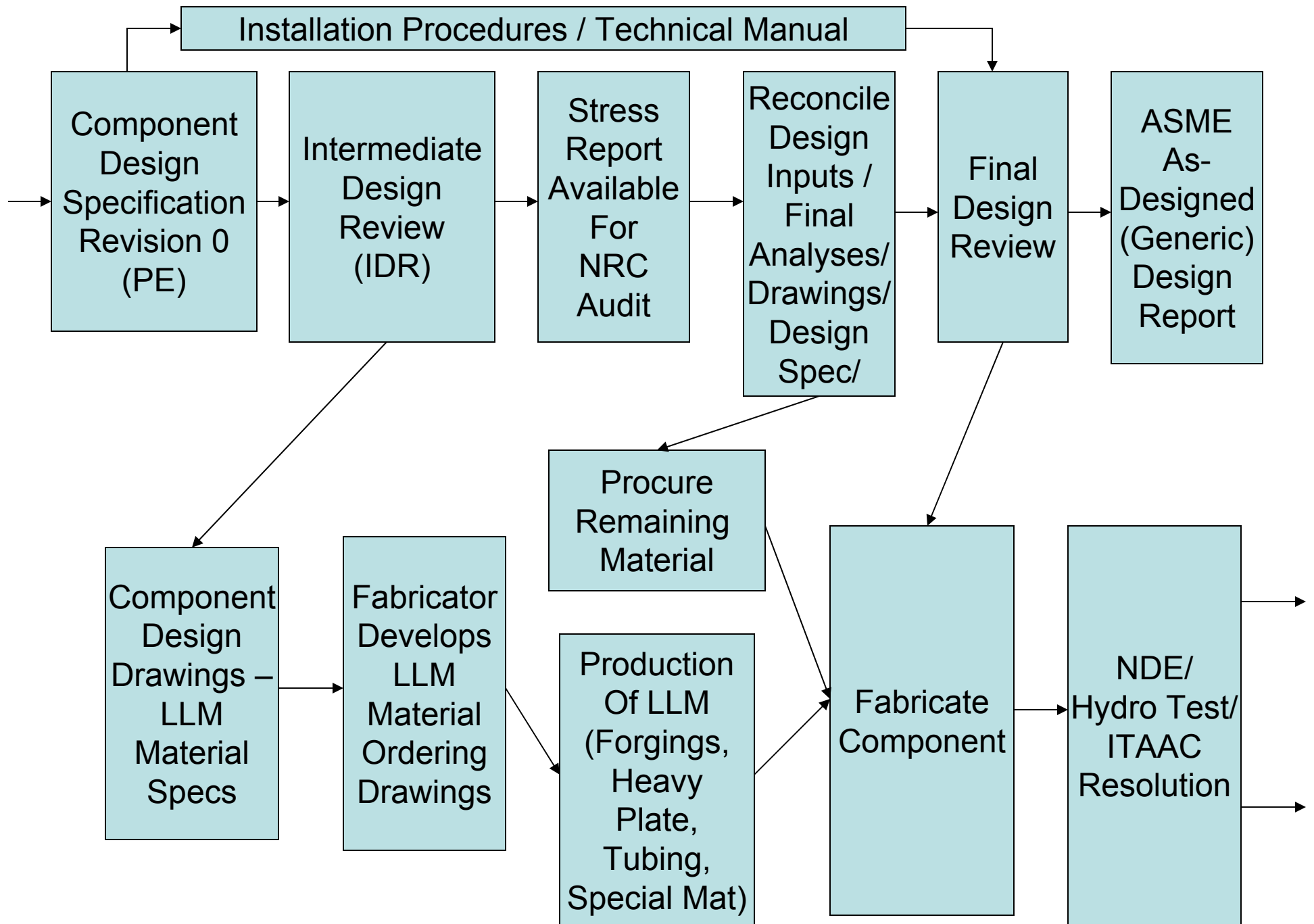
Piping Analysis Activities Remaining

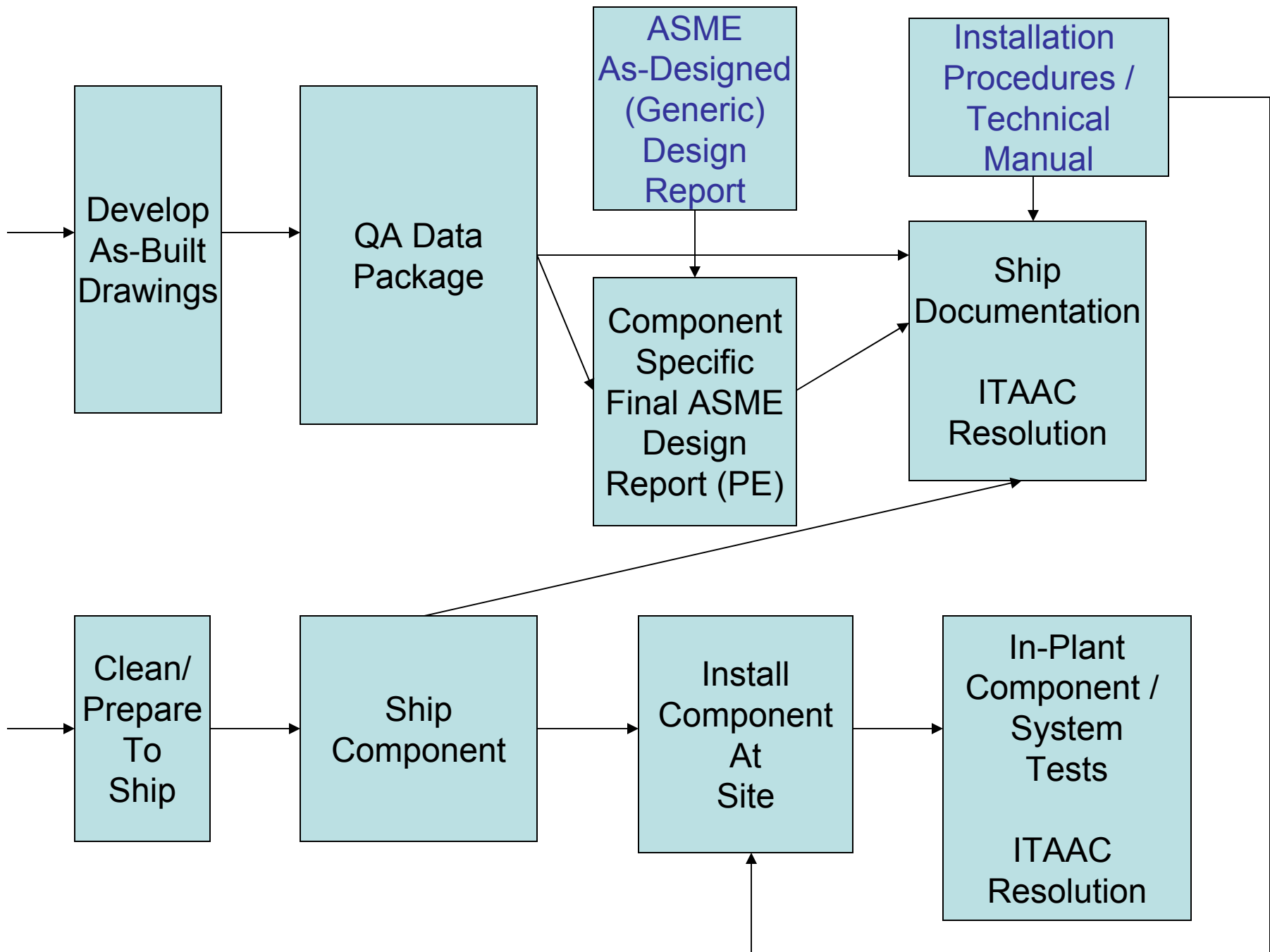
- Reconcile analysis to extended spectra.
- Evaluate effects of shield building enhancements.
- Complete support and hanger design
- Complete fatigue evaluation
- Prepare as-designed generic design reports.

ASME Components Design and Analysis

Component Design, Analysis, and Fabrication Process







Steam Generator

- Design Specification Complete
- Design Report Complete for Primary Pressure Boundary and Feedwater Nozzle (includes fatigue analysis)
- Thermal Analyses Supporting Stress Analyses Complete
- Intermediate Design Review Complete
- Drawings

Reactor Vessel

- Design Specification Complete
- Reactor Vessel Analyses and Evaluations Completed
 - Reactor Vessel Sizing Calculation
 - Reactor Vessel Fracture Mechanics Evaluation
 - Detailed and Transient Analysis of Lower Shell and Lower Head
 - Analysis of Closure Head Penetrations
 - Design Transient Groupings and Heat Transfer Coefficient Development
- Intermediate Design Review Complete
- Drawings

Reactor Internals

- Design Specification Complete
- Stress Report Complete for Core Support Structures
- RVI Vibration Assessment Report Complete
- Hot Functional Vibration Test Predictions/Acceptance Criteria Report Complete
- Drawings

In-Core Instrumentation (ICI) Guide Tube

- Design Requirements Complete
 - Part of Reactor Vessel Design Specification
- ICI Guide Tube Pressure Boundary Analysis Complete
 - Includes Thermal and Seismic Analysis

Control Rod Drive Mechanisms

- Design Specification Complete
- Stress Report for Pressure Boundary Components Complete
- Pressure Boundary Component Drawings

Pressurizer

- Design Specification Complete
- Detailed Stress and Transient Analyses Completed
 - Heads, Shell, and Nozzles
 - Manway
 - Pressurizer Bracket for ADS Module
- Intermediate Design Review Complete
- Drawings

Reactor Coolant Pump

- Design Specification Complete
- Seismic Analysis Report Complete
- Casing and Main Closure Pressure Boundary Components Report Complete
- Report on Safety-Related Non-Pressure Boundary Parts Analyses Complete
- Flywheel Structural Analysis Summary Report Complete
- Pump Component Intermediate Design Reviews
- Drawings

Passive RHR Heat Exchanger

- Design Specification Complete
- Design Report Complete
 - Head and Extended Flange Transient Analysis
 - Allowable Nozzle Loads
 - Tube Support Analysis
- Intermediate Design Review Complete
- Drawings

Accumulator

- Design Specification Complete
- Stress Report Complete
- NRC Audit of Stress Report Complete
- Intermediate Design Review Complete
- Drawings

Core Makeup Tank

- Design Specification Complete
- Stress Report Complete
- NRC Audit of Stress Report Complete
- Intermediate Design Review Complete
- Drawings

Safety-Related Valves

- ASME Valves Design Specifications nearing completion
- NuStart comment addressed
- Supplier comments addressed
- EQ requirements complete

Valve Design Specifications

VALVE SPECIFICATION TITLE	STATUS
Motor Operated Globe and Gate Valves	Valve Data Sheet Report is being developed. NuStart Comments incorporated.
2" & Smaller Man. Operated Globe and Check Valves	Preliminary rev. completed. Final revision and PE review in progress.
3" & Larger Man. Operated Gate, Globe and Check Valves	Preliminary rev. completed. Final revision and PE review in progress. May need Nustart review and comments.
Ball and Plug Valves	Preliminary rev. completed. Final revision and PE review in progress.
Butterfly Valves	Valve Data Sheet Report is being developed. NuStart Comments incorporated.
Solenoid Valves	Preliminary rev. completed. Final revision and PE review in progress. May need Nustart review and comments.
Air Operated Globe Valves	Valve Data Sheet Report is being developed. NuStart Comments incorporated.
Pressure Regulating Valves	Preliminary rev. completed. Final revision and PE review in progress.
Auxiliary Relief Valves	Preliminary rev. completed. Final revision and PE review in progress.
Instrumentation Valves	Preliminary rev. completed. Final revision and PE review in progress.
Vacuum Breaker Valves	Preliminary rev. completed. Final revision and PE review in progress.

Valve Design Specifications

VALVE SPECIFICATION TITLE	STATUS
Pressurizer Safety valve	Preliminary rev. completed. Final revision and PE review in progress. May need Nustart review and comments.
Pressurizer Spray Valve	Preliminary rev. completed. Final revision and PE review in progress. May need Nustart review and comments.
Main Steam Isolation (MSIV)	Final revision and PE review in progress. NuStart comments have been incorporated.
Main Steam Safety Valves (MSSV)	Final revision and PE review in progress. May need Nustart review and comments.
Main Steam Power Operated Relief Valve (MSPORV)	Valve Data Sheet Report is being developed.
Feedwater Isolation Valve (FWIV)	Waiting for resolution and signoff of MSIV
Feedwater Check Valve (FWCV)	Valve Data Sheet Report is being developed.
Feedwater Control Valve (FCV)	Valve Data Sheet report is being developed.
Squib Valves	Preliminary specification has been developed, Open items remain on the actuator under development.
Electric Motor Actuators for ASME Section III Valves	Actuator specification has been reviewed and comments incorporated from NuStart and Supplier.

Review of Documents Analyses and Calculations