Becht Nuclear Services
Technical Training Curriculum

We are pleased to offer this series of courses in structural and mechanical engineering for nuclear power plants. Each course can be tailored to the plant's needs.

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ASME III for the Design and Qualification of Pressure Vessels (2 days)

This course covers the design and qualification of pressure vessels in accordance with ASME III Class 1,2,3. It explains the requirements covered in ASME III NB /NC / ND-3200 and 3300, and additional requirements that are not in the Code. The course also addresses the design differences between Class 1, 2, and 3. The course includes case studies of nuclear vessels design.

ASME III for the Design and Qualification of ASME III and B31.1 Piping Systems (2 days)

This course covers the design and qualification of piping systems in accordance with ASME III Class 1,2,3. It explains the requirements covered in ASME III NB /NC / ND-3600, and additional requirements that are not in the Code. The course also addresses the design differences between Class 1, 2, and 3. The course includes case studies of nuclear piping design.

Introduction to the ASME Boiler & Pressure Vessel Code as it Relates to Nuclear Components (1 day)

This Code provides an introduction to the ASME B&PV Code requirements related to nuclear components (vessels, pumps, valves, piping, tanks, and reactor internals) and their supports. The course covers overview of the Code sections and their scope, material requirements (ASME II and III), design requirements (ASME III), fabrication requirements (ASME III and XI), non-destructive examination of new components (ASME III and V), pressure and leak testing requirements (ASME III and V), stamping and documentation (ASME III NCA), in-service inspections (ASME XI), integrity assessments (ASME XI), and repairs (ASME XI).

Overview of Key Technical Changes in ASME III Design for Reconciliation of Code Editions (1 day)

This course covers the changes that have occurred over the years, from the 1960's till now, in design requirements of ASME III NC/ND for vessels and piping. This historical perspective is meant to highlight technical changes to help engineers perform reconciliation of design requirements when using a more recent code edition and addendum.

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Pre-Operational Start-Up Vibration and Thermal Expansion Testing of Class 2-3 and B31.1 Piping Systems (2 days)

This course presents the engineering objectives, the code and regulatory requirements, the methods and criteria for pre-operational vibration testing and thermal expansion testing of piping systems in a PWR. It includes instructor's experiences and lessons learned on pre-operational vibration and thermal expansion testing.

Causes, Effects, and Prevention of Waterhammer in Nuclear Power Plants (1 day)

This course explains the different types of waterhammer that can occur in nuclear plant systems. Anticipated and unanticipated events are defined. The course explains the physics of the transients, how to predict and calculate their effects, how to walk-down and inspect the systems after a waterhammer, how to assess return to service, and how to prevent recurrence. The course includes introduction and overview to numerical simulation of waterhammer pressures.

Causes, Effects, and Prevention of Flow-Induced Vibration in Nuclear Power Plant Piping (1 day)

This course explains the different types of flow-induced vibration in piping systems. The course explains the driving forces, the potential resonance effects (acoustic and structural), how to make run-or-repair decisions I the presence of vibration, and how to prevent recurrence. The course includes application of the rules of ASME O&M Part 3 for the three-level evaluation of vibration.

Development of Input Motions and Seismic Evaluations of Structures, Systems, and Components (1 day)

Nuclear Power Plants are required to evaluate the effects of postulated earthquakes on the plant structures, systems, and components. This course provides an overview of the seismic evaluation process starting with the concept of seismic hazard curves, and proceeding through site response analysis, overview of soil-structure interaction, development of structure foundation motions, and modification of the motions through the building structure to develop in-structure response spectra to be used in the evaluation of systems, subsystems, and components. With the seismic input motion defined, the analytical evaluation of the structure, system, or component can begin. Approaches to the seismic evaluation can include equivalent static methods, response spectrum analysis, mode superposition, and in some cases full time integration analysis. Each approach has its application and each will be discussed in this course. Finally, the sometimes overlooked, but critical question of "what to do with the results" will be addressed.

Repair or Pressure Equipment and Piping in Accordance with ASME XI and ASME PCC-2 (1 day)

This course covers the various repair techniques for pressure vessels, tanks, and piping systems. The more general repair techniques are addressed in ASME PCC-2 and can be used for non-safety-related components. The more limited approved repair options are dispersed in ASME XI and in Code Cases.

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Overview of the Seismic Probabilistic Risk Assessment (SPRA) Process (1 day)

New nuclear power plants are required by Federal Regulation to include Probabilistic Risk Assessment information in the license application and in the Final Safety Analysis Report (FSAR). One of the required PRA's is a seismic PRA, but what exactly is an SPRA and how is it constructed? This course will describe the objective of an SPRA, provide an overview of the fundamental building blocks or modules for an SPRA, and describe the interplay between the different modules and the role that each module plays in achieving the objective of the SPRA. This course will also provide a summary of the Generic Implementation Procedure (GIP) developed to resolve USI A-46. The methods developed in the GIP still provide insights that are valuable to engineers performing seismic evaluations or seismic walkdowns.

As-built Reconciliation for Mechanical Equipment (1 day)

This course addresses the types of as-built vs. as-design deviations in the installation of mechanical equipment, and how to reconcile the deviations in order to decide which ones are acceptable as-installed and which ones must be re-worked. The course is based on nearly 40 years of implementation of as-built reconciliation, since the issue of NRC Bulletin 79-14, and follow-up industry guidelines.

Nuclear Equipment Qualification (1 day)

This course addresses the requirements, regulations, methods and criteria for the environmental and seismic qualification of mechanical and electrical systems and components. The course is built around the regulatory requirements in SAR Sections 3.10 and 3.11; and Regulatory Guides 1.73, 1.89, 1.100, and 1.122; ASME QME-1, IEEE-323, 344, and 382. The course addresses the role of analysis vs. testing, the sequence of tests to be conducted, and the documentation of the test specification and test report.

Pipe Break and Missiles (1 day)

This course presents the regulatory criteria for the postulation of high energy line breaks, and high and moderate energy line cracks. The course proceeds to explain how to calculate the resulting dynamic effects (blowdown, subcompartment pressures, whip and jet), and the flood and environmental effects of postulated leaks and breaks. The design of whip restraints and jet shields is also addressed. The course presents an overview of the purpose, methods and criteria for leak-before-break (LBB) and the elimination of dynamic effects using LBB.

Evaluation of Wall Thinning Corrosion or Erosion in Piping Systems using ASME XI CC N-513 and N-597 (1 day)

This course covers the technical bases of the two ASME XI Code Cases for the evaluation of corroded piping, CC N-513 and N-597. It explains the technical basis of the assessments and the NRC conditions of applicability. The seminar also addresses options if the corroded pipe does not meet the limits in N-513 and N-597.

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Evaluation of Operability of Piping Systems using ASME III Div.1 Appendix F (1 day)

This course explains the Appendix F options for the analysis of an abnormal condition in which the piping system does not meet the design stress equations of ASME III NB / NC/ND-3600 or ASME B31.1. Each of these finite-element-based analyses is illustrated using a common-thread example. The NRC position regarding the use of Appendix F is outlined.

Evaluation of Crack-Like Flaws using ASME XI Failure Assessment Diagram (1 day)

This course introduces the concept of fracture mechanics for the evaluation of a crack-like flaw discovered during inspection. The method of ASME XI failure assessment diagram is illustrated through an example. The overview explains the important difference between the evaluation of a fabrication crack, a fatigue crack, and a corrosion-induced crack.

Evaluation of Wall Thinning Corrosion or Erosion in Buried Piping Systems using ASME XI CC N-806 (1 day)

This course covers the technical bases of ASME XI Code Case N-806 for the evaluation of corroded buried piping. It explains the technical basis of the assessments and the NRC conditions of applicability. The seminar also addresses options if the corroded pipe does not meet the limits in N-806.

Application of ASME FFS-1 for the Evaluation of Remaining Life of Non-Safety Corroded Tanks, Vessels, Piping (2 days)

This course covers the methods, formulas, and criteria for the evaluation of corrosion damage in non-safety tanks, vessels, and piping. The damage mechanisms covered are general metal loss, local thin areas, pitting, and crack-like flaws. The standard used is ASME FFS-1 which reflects state-of-the-art in the evaluation of damage mechanisms.

Lessons Learned from Issues Related to Mechanical Equipment and Systems in Nuclear Power Plants (1 day)

An interesting review of key issues the industry has faced from the early 1970's till now related to the design, fabrication, inspection, and integrity of mechanical active components (pumps, compressors, fans, valve operators), fixed equipment (tanks and vessels), and distribution systems (piping and duct systems). The focus is to understand and learn from the issues the industry faced, their regulatory context, how these issues have been resolved, and what actions were taken to prevent recurrence. The course flows chronologically, following the NRC notices, bulletins, generic letters, and other publications, while grouping common issues to draw important lessons learned.