The National Board Body of Knowledge for the **Authorized Inspector (AI)**

SINCE 1919

Approved by: _____ 12.5.24

Executive Director — Approval Date

The National Board of Boiler and Pressure Vessel Inspectors
1055 Crupper Avenue ◆ Columbus, OH 43235
614.888.8320

NBBI.org
» CONNECT WITH US

NB-331-NC Rev 7
*Denotes Revisions

The National Board Body of Knowledge for the **Authorized Inspector (AI)**

The National Board has developed this Body of Knowledge to outline duties and responsibilities for inspectors performing inspections during the construction phase of pressure equipment built in accordance with the *ASME Boiler and Pressure Vessel Code*.

Objectives

* An individual responsible for performing inspections of pressure equipment during the construction phase should have knowledge, and the ability to apply that knowledge, of the following:
    - Duties of the Authorized Inspector (AI)
    - Quality Management Systems
    - Design and Design Calculations
    - Materials
    - Fabrication
    - Welding
    - Nondestructive Examination
    - Heat Treatment
    - Inspection and Testing
    - Calibration of Measurement and Test Equipment
    - Nonconformities
    - Data Reports and Marking
    - Record Retention

Reference Material

* The following reference material is required to obtain and apply the knowledge of the listed objectives in this Body of Knowledge.
    - ASME Section I, *Power Boilers*
    - ASME B31.1, *Power Piping*
    - ASME Section IV, *Heating Boilers*
    - ASME Section V, *Nondestructive Examination*
    - ASME Section VIII Divisions 1, 2, and 3, *Pressure Vessels*
    - ASME Section IX, *Welding, Brazing, and Fusing*
    - ASME QAI-1, *Qualifications for Authorized Inspection*
    - ASME CA-1, *Conformity Assessment Requirements*
    - RCI-1, NB-263, *Rules for Commissioned Inspectors*

Body of Knowledge Outline

This outline provides information regarding the listed objectives of this Body of Knowledge, and further describes the duties and responsibilities of the Authorized Inspector.

* 1. Duties of the Authorized Inspector

Familiarity with RCI-1 and ASME QAI-1 applicable to:

- Authorized Inspection Agencies
- Authorized Inspector Supervisors
- Authorized Inspectors

Additional duties are defined throughout the reference material.

2. Boiler and Pressure Vessel Types and Terminology

Ability to identify boiler and pressure vessel types and their corresponding parts.

3. Code Structure and Content

Understanding of *ASME Boiler and Pressure Vessel Code* book structure, and the ability to locate the appropriate requirements within the Code books and related documents.

* 4. Quality Management System

Familiarity with and understanding of quality management system elements as defined by:

- ASME Section I, Appendix A-301
- ASME Section IV, Appendix F
- ASME Section VIII, Div. 1, Appendix 10
- ASME CA-1

5. Design

Familiarity with design rules and formulas applicable to power and heating boilers, boiler external piping, and pressure vessels. Included in the general design sessions are rules for:

*
- owner identified loadings
- shells and drums
- piping, headers and nozzles
- formed and flat heads
- braced and stayed surfaces
- weld sizes
- nozzle reinforcement
- prefabricated or preformed pressure parts
- flanges
- joint efficiencies
- ligament efficiency

6. Materials

Ability to determine acceptance of materials based upon rules applicable to:

* • the respective ASME Code construction sections, including exceptions
- dimensional tolerances based on product form
- markings and permitted marking methods
- pressure parts vs. nonpressure parts
- materials produced to standards other than ASME
- repair of defective material
- material certifications

7. Fabrication

Ability to determine compliance with fabrication requirements, including:

- General Fabrication Rules governing
  - Cutting and edge preparation
  - Limits on cold forming
  - Limits on out of roundness for cylindrical, conical and spherical shells
  - Tolerances on formed heads
  - Lugs and fitting attachment
  - Holes for screwed or threaded stays
  - Holes for tubes
  - * Inspection of materials
- Welded Fabrication rules governing
  - Responsibilities
  - Permitted welding processes
  - Qualification requirements for procedures
  - Qualification requirements for welders and welding operators
  - Cleaning of weld surfaces
  - Alignment tolerances
  - Spin holes
  - Finished weld joints
  - Fillet welds
  - Repair of weld defects
  - Peening
  - Surface weld metal buildup

8. Nondestructive Examination

Ability to determine the requirements for nondestructive examination (NDE) which include the following:

- When NDE is required
- Which NDE methods are permitted
- Advantages and limitations of different NDE methods
- Procedure qualification requirements
- Personnel qualification requirements
- NDE reporting requirements

* 9. Heat Treatment, Inspection, and Test

Familiarity with requirements for, and possible exemptions and alternatives to, the following treatments, inspections, and tests:

- Impact testing
- Heat treatment
- Inspection of pressure tests

10. Calibration of Measurement and Test Equipment (M&TE)

Understanding of requirements for the calibration of M&TE which includes working and master standards to include:

- Calibration frequencies
- Calibration methods
- Tolerances
- Master standards
- Identification
- Records

* 11. Data Reports and Marking

Ability to determine data report and associated marking requirements which apply for a given type of construction.

12. Record Retention

Ability to determine record retention requirements as applied to ASME Sections I, IV, and VIII.