



**THE NATIONAL BOARD
BODY OF KNOWLEDGE
FOR**

AUTHORIZED INSPECTORS

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Approved by:


Executive Director

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(date of approval)

*Denotes Revisions

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THE NATIONAL BOARD

*** BODY OF KNOWLEDGE FOR AUTHORIZED INSPECTORS**

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 inspection of pressure equipment during the construction phase should have knowledge, and the ability to apply that knowledge, of the following:

- Responsibilities and Duties of the Authorized Inspector (AI)
- Quality Control Systems
- Design and Design Calculations
- Materials
- Fabrication
- Welding
- Nondestructive Examination,
- Testing and Heat Treatment
- Calibration of Measurement and Test Equipment
- Data Reports and Stamping
- 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 B.31.1, Power Piping
- ASME Section IV, Heating Boilers
- ASME Section V, Nondestructive Examination
- ASME Section VIII Division 1, Pressure Vessels
- ASME Section IX, Welding and Brazing
- ASME QAI-1, *Qualifications for Authorized Inspection*
- RCI-1, NB-263, *Rules for Commissioned Inspectors*

Approved translations are acceptable.

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. *Responsibilities and Duties of the AI*

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

- Authorized Inspection Agencies,
- Authorized Inspector Supervisors, and
- Authorized Inspectors.

Additional duties and responsibilities 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 Control System*

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

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

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:

- 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
- 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, and
 - Holes for tubes.
- 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, and
 - 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, and
- NDE reporting requirements.

9. *Testing and Heat Treatment*

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

- Impact testing,
- Heat treatment, and
- 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, and
- Records.

11. Data Reports and Stamping

Ability to determine data report and associated stamping 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.