The National Board Body of Knowledge for the **Inservice Inspector (IS)**

SINCE 1919

Approved by: _____ 3-20-25

Executive Director Approval Date

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The National Board Body of Knowledge for the
Inservice Inspector (IS)

The National Board has developed this Body of Knowledge to outline the duties, responsibilities, knowledge, and skills required for the inservice inspection of pressure-retaining items during their installation and operation.

Objectives

An Individual responsible for inservice inspection of pressure-retaining items should have knowledge, and the ability to apply that knowledge, of the following:

- Code Calculations
- Nondestructive Examination
- Pressure Testing
- Inservice Inspection
- Boiler and Pressure Vessel Terminology
- Conditions Causing Deterioration or Failures
- Pressure Relief Devices
- Control and Safety Devices
- Installation

Reference Material

The following reference material is required to obtain and apply the knowledge of the listed objectives in this Body of Knowledge.

- RCI-1, NB-263, *Rules for Commissioned Inspectors*
- *National Board Inspection Code* (NBIC), Part 1, *Installation*
- *National Board Inspection Code* (NBIC), Part 2, *Inspection*
- ASME Section I, *Power Boilers*
- ASME B.31.1, *Power Piping*
- ASME Section IV, *Heating Boilers*
- ASME Section VIII, Division 1, *Pressure Vessels*
- ASME CSD-1, *Controls and Safety Devices for Automatically Fired Boilers*

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 Inservice Inspector.

* 1. Inservice Inspection

An understanding of the requirements for inservice inspection of pressure-retaining items, as specified in the NBIC Part 2, *Inspection*. This includes a knowledge of internal/external inspection requirements, safety considerations and confined space entry requirements, venting and fuel supply systems, and identification of types of deterioration and safety hazards. Additionally, it covers a basic understanding of proper repair and alteration methods used on inservice equipment, such as welding performed in accordance with NBIC Part 3, *Repairs and Alterations*.

* 2. Boiler and Pressure Vessel Types and Terminology

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

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3. Conditions Causing Deterioration or Failures

Ability to identify and understand the effects of operations on pressure-retaining items, including:

- Types of Corrosion and Deterioration
  - uniform corrosion
  - galvanic corrosion
  - erosion corrosion
  - crevice corrosion
  - pitting corrosion
  - line corrosion
  - exfoliation
  - selective leaching
  - grooving
  - stress corrosion cracking
- Failure/Damage Mechanisms
  - chemical attack
  - creep
  - fatigue
  - fracture
  - thermal aging
- Corrosion Calculations
  - corrosion rate determination
  - corrosion averaging
  - local metal loss
  - weld joint efficiency factor
  - corrosion in central portion of formed heads
  - estimated remaining life and corrosion rate

* 4. Installation

Ability to identify and understand the general requirements (including those of the local jurisdiction) for installation of pressure-retaining items in accordance with NBIC Part 1, *Installation*, including requirements for:

- steam/hot water heating boilers
- hot water supply boilers
- potable water heaters
- pressure vessels
- piping
- welding
- venting
- fuel supply systems
- power/heating boilers
  - source requirements
  - discharge requirements
  - operating systems
  - controls and gages
  - pressure relief devices

5. Code Calculations

Ability to perform calculations, as they apply to re-ratings and remaining life. For example:

- components under internal pressure
  - calculation of minimum required thickness or maximum allowable working pressure (MAWP) of items such as tubing, piping, drums, shells, headers, and heads
- static head calculations
  - difference between vessel MAWP and vessel component MAWP
  - static head pressure on any vessel component
  - total pressure (MAWP + static head) on any vessel component
- remaining life and inspection interval calculations
  - calculation of metal loss (including corrosion averaging), corrosion rates, remaining service life, and inspection interval

6. Nondestructive Examination

Ability to define and understand the requirements and guidelines for performing examinations and tests for the installation and inspection of pressure-retaining items; ability to define and understand the principles of the following nondestructive examination methods:

- radiography
- ultrasonic testing
- magnetic particle testing
- liquid penetrant testing
- visual examination

7. Pressure Testing
   Ability to define and understand the requirements and guidelines for performing examinations and tests for the installation and inspection of pressure-retaining items; ability to define and understand the different pressure testing methods and principles, such as:
   - liquid pressure test
   - pneumatic test
   - initial service leak test
   - vacuum test

8. Pressure Relief Devices
   Ability to define and understand set pressure and relieving capacity requirements for pressure-relieving devices, including:
   - application and limitations
   - sizing for pressure and capacity
   - set pressures and allowable deviations
   - causes of improper performance
   - reasons for inspection and frequency determination
   - inspection and test service procedures
   - maintenance inspection safety practices

9. Controls and Safety Devices
   Ability to define and understand controls and devices, including:
   - fuel
   - waterside
   - fireside
   - limit switches and device types
   - level indicators