

2011 NBIC

PART 1, INSTALLATION

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National Board Inspection Code 2011 Edition Date of Issue — July 31, 2011

This code was developed under procedures accredited as meeting the criteria for American National Standards. The Consensus Committee that approved the code was balanced to ensure that individuals from competent and concerned interests had an opportunity to participate. The proposed code was made available for public review and comment, which provided an opportunity for additional public input from industry, academia, regulatory and jurisdictional agencies, and the public-at-large.

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Participation by federal agency representative(s) or person(s) affiliated with industry is not to be interpreted as government or industry endorsement of this code.

The National Board accepts responsibility for only those interpretations issued in accordance with governing National Board procedures and policies that preclude the issuance of interpretations by individual committee members.

The footnotes in this document are part of this American National Standard.



The above National Board symbols are registered with the US Patent Office.

“National Board” is the abbreviation for The National Board of Boiler and Pressure Vessel Inspectors.

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Foreword

The National Board of Boiler and Pressure Vessel Inspectors is an organization comprised of Chief Inspectors for the states, cities, and territories of the United States and provinces and territories of Canada. It is organized for the purpose of promoting greater safety to life and property by securing concerted action and maintaining uniformity in post-construction activities of pressure-retaining items, thereby ensuring acceptance and interchangeability among Jurisdictional authorities responsible for the administration and enforcement of various codes and standards.

In keeping with the principles of promoting safety and maintaining uniformity, the National Board originally published The NBIC in 1946, establishing rules for inspection and repairs to boilers and pressure vessels. The National Board Inspection Code (NBIC) Committee is charged with the responsibility for maintaining and revising the NBIC. In the interest of public safety, the NBIC Committee decided, in 1995, to revise the scope of the NBIC to include rules for installation, inspection, and repair or alteration to boilers, pressure vessels, piping, and nonmetallic materials.

In 2007, the NBIC was restructured into three Parts specifically identifying important post-construction activities involving safety of pressure-retaining items. This restructuring provides for future expansion, transparency, and uniformity, ultimately improving public safety.

The NBIC Committee's function is to establish rules of safety governing post-construction activities for the installation, inspection and repair and alteration of pressure-retaining items, and to interpret these rules when questions arise regarding their intent. In formulating the rules, the NBIC Committee considers the needs and concerns of individuals and organizations involved in the safety of pressure-retaining items. The objective of the rules is to afford reasonably certain protection of life and property, so as to give a reasonably long, safe period of usefulness. Advancements in design and material and the evidence of experience are recognized.

The rules established by the NBIC Committee are not to be interpreted as approving, recommending, or endorsing any proprietary or specific design, or as limiting in any way an organization's freedom to choose any method that conforms to the NBIC rules.

The NBIC Committee meets regularly to consider revisions of existing rules, formulation of new rules, and respond to requests for interpretations. Requests for interpretation must be addressed to the NBIC Secretary in writing and must give full particulars in order to receive Committee consideration and a written reply. Proposed revisions to the Code resulting from inquiries will be presented to the NBIC Committee for appropriate action.

Proposed revisions to the Code approved by the NBIC Committee are submitted to the American National Standards Institute and published on the National Board Web site to invite comments from all interested persons. After the allotted time for public review and final approval the new edition is published.

Organizations or users of pressure-retaining items are cautioned against making use of revisions that are less restrictive than former requirements without having assurance that they have been accepted by the Jurisdiction where the pressure-retaining item is installed.

The general philosophy underlying the NBIC is to parallel those provisions of the original code of construction, as they can be applied to post-construction activities.

The NBIC does not contain rules to cover all details of post-construction activities. Where complete details are not given, it is intended that individuals or organizations, subject to the acceptance of the Inspector and Jurisdiction when applicable, provide details for post-construction activities that will be as safe as otherwise provided by the rules in the original Code of Construction.

Activities not conforming to the rules of the original code of construction or the NBIC must receive specific approval of the Jurisdiction, who may establish requirements for design, construction, inspection, testing, and documentation.

There are instances where the NBIC serves to warn against pitfalls; but the Code is not a handbook, and cannot substitute for education, experience, and sound engineering judgment.

It is intended that this Edition of the NBIC not be retroactive. Unless the Jurisdiction imposes the use of an earlier edition, the latest effective edition is the governing document.

Introduction

It is the purpose of the National Board Inspection Code (NBIC) to maintain the integrity of pressure-retaining items by providing rules for installation, and after the items have been placed into service, by providing rules for inspection and repair and alteration, thereby ensuring that these items may continue to be safely used.

The NBIC is intended to provide rules, information and guidance to manufacturers, Jurisdictions, inspectors, owner-users, installers, contractors, and other individuals and organizations performing or involved in post-construction activities, thereby encouraging the uniform administration of rules pertaining to pressure-retaining items.

Scope

The NBIC recognizes three important areas of post-construction activities where information, understanding, and following specific requirements will promote public and personal safety. These areas include:

- Installation
- Inspection
- Repairs and Alterations

The NBIC provides rules, information, and guidance for post-construction activities, but does not provide details for all conditions involving pressure-retaining items. Where complete details are not provided in this Code, the Code user is advised to seek guidance from the Jurisdiction and from other technical sources.

The words shall, should, and may are used throughout the NBIC and have the following intent:

- Shall – action that is mandatory and required.
- Should – indicates a preferred but not mandatory means to accomplish the requirement unless specified by others such as the Jurisdiction.
- May – permissive, not required or a means to accomplish the specified task.

Organization

The NBIC is organized into three Parts to coincide with specific post-construction activities involving pressure-retaining items. Each Part provides general and specific rules, information, and guidance within each applicable post-construction activity. Other NBIC Parts or other published standards may contain additional information or requirements needed to meet the rules of the NBIC. Specific references are provided in each Part to direct the user where to find this additional information. NBIC Parts are identified as:

- Part 1, Installation – This Part provides requirements and guidance to ensure all types of pressure-retaining items are installed and function properly. Installation includes meeting specific safety criteria for construction, materials, design, supports, safety devices, operation, testing, and maintenance.
- Part 2, Inspection – This Part provides information and guidance needed to perform and document inspections for all types of pressure-retaining items. This Part includes information on personnel safety, non-destructive examination, tests, failure mechanisms, types of pressure equipment, fitness for service, risk-based assessments, and performance-based standards.

- Part 3, Repairs and Alterations – This Part provides information and guidance to perform, verify, and document acceptable repairs or alterations to pressure-retaining items regardless of code of construction. Alternative methods for examination, testing, heat treatment, etc., are provided when the original code of construction requirements cannot be met. Specific acceptable and proven repair methods are also provided.

Each NBIC Part is divided into major Sections as outlined in the Table of Contents.

Tables, charts, and figures provide relevant illustrations or supporting information for text passages, and are designated with numbers corresponding to the paragraph they illustrate or support within each Section. Multiple tables, charts, or figures referenced by the same paragraph will have additional letters reflecting the order of reference. Tables, charts, and figures are located in or after each major Section within each NBIC Part.

Text Identification and Numbering

Each page in the text will be designated in the top header with the publication's name, part number, and part title. The numbering sequence for each section begins with the section number followed by a dot to further designate major sections (e.g., 1.1, 1.2, 1.3). Major sections are further subdivided using dots to designate subsections within that major section (e.g., 1.1.1, 1.2.1, 1.3.1). Subsections can further be divided as necessary.

Paragraphs under sections or subsections shall be designated with small letters in parenthesis (e.g., a), b), c)) and further subdivided using numbers in parenthesis (e.g., 1), 2), 3)). Subdivisions of paragraphs beyond this point will be designated using a hierarchical sequence of letters and numbers followed by a dot.

Example: 2.1 Major Section
 2.1.1 Section
 2.1.2 Section
 2.1.2. Subsection
 a) paragraph
 b) paragraph
 1) subparagraph
 2) subparagraph
 a. subdivisions
 1. subdivisions
 2. subdivisions
 b. subdivisions
 1. subdivisions
 2. subdivisions

Tables and figures will be designated with the referencing section or subsection identification. When more than one table or figure is referenced in the same section or subsection, letters or numbers in sequential order will be used following each section or subsection identification.

Supplements

Supplements are contained in each Part of the NBIC to designate information only pertaining to a specific type of pressure-retaining item (e.g., Locomotive Boilers, Historical Boilers, Graphite Pressure Vessels.) Supplements follow the same numbering system used for the main text only preceded by the Letter “S.” Each page of the supplement will identify the supplement number and name in the top heading.

Interpretations

On request, the NBIC Committee will render an interpretation of any requirement of this Code. Interpretations are provided for each Part and are specific to the Code edition and addenda referenced in the interpretation. Interpretations provide information only and are not part of this Code.

Jurisdictional Precedence

Reference is made throughout this Code to the requirements of the “Jurisdiction.” Where any provision herein presents a direct or implied conflict with any jurisdictional regulation, the Jurisdictional regulation shall govern.

Units of Measurement

Both U.S. customary units and metric units are used in the NBIC. The value stated in U.S. customary units or metric units are to be regarded separately as the standard. Within the text, the metric units are shown in parentheses. In Supplement 6, Parts 2 and 3, Continued Service and Inspection of DOT Transport Tanks, the metric units are shown first with the U.S. customary units shown in parentheses.

U.S. customary units or metric units may be used with this edition of the NBIC, but one system of units shall be used consistently throughout a repair or alteration of pressure-retaining items. It is the responsibility of National Board accredited repair organizations to ensure the appropriate units are used consistently throughout all phases of work. This includes materials, design, procedures, testing, documentation, and stamping. The NBIC policy for metrication is outlined in each part of the NBIC.

Accreditation Programs

The National Board administers and accredits three specific repair programs¹ as shown below:

- “R” Repairs and Alterations to Pressure-Retaining Items
- “VR” Repairs to Pressure Relief Valves
- “NR” Repair and Replacement Activities for Nuclear Items

Part 3, Repairs and Alterations, of the NBIC describes the administrative requirements for the accreditation of these repair organizations.

The National Board also administers and accredits four specific inspection agency programs as shown below:

New Construction

Criteria for Acceptance of Authorized Inspection Agencies for New Construction
(NB-360)

Inservice

Qualifications and Duties for Authorized Inspection Agencies (AIAs) Performing In-service Inspection Activities and Qualifications for Inspectors of Boilers and Pressure Vessels
(NB-369)

Owner-User

Accreditation of Owner-User Inspection Organizations (OUIO) (NB-371) Owners or users may be accredited for both a repair and inspection program provided the requirements for each accreditation program are met.

Federal Government

Qualifications and Duties for Federal Inspection Agencies Performing Inservice Inspection Activities (FIAs) (NB-390)

These programs can be viewed on the National Board Web site. For questions or further information regarding these programs contact:

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Certificates of Authorization for Accreditation Programs

Any organization seeking an accredited program may apply to the National Board to obtain a Certificate of Authorization for the requested scope of activities. A confidential review shall be conducted to evaluate the organization’s quality system. Upon completion of the evaluation, a recommendation will be made to the National Board regarding issuance of a Certificate of Authorization.

Certificate of Authorization scope, issuance, and revisions for National Board accreditation programs are specified in the applicable National Board procedures. When the quality system requirements of the appropriate accreditation program have been met, a Certificate of Authorization and appropriate National Board symbol stamp shall be issued.

¹ Caution, some Jurisdictions may independently administer a program of authorization for organizations to perform repairs and alterations within that Jurisdiction.

2011
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2011 NBIC
PART 1, SECTION 1
INSTALLATION – GENERAL GUIDELINES

PART 1, SECTION 1 INSTALLATION — GENERAL GUIDELINES

1.1 INTRODUCTION

The proper installation of boilers, pressure vessels, piping, and other pressure-retaining items is essential for safe and satisfactory operation. The owner-user is responsible for ensuring that installations meet all the requirements of the Jurisdiction at the point of installation including licensing, registration, or certification of those performing installations. NBIC Part 1, identifies minimum safety requirements for installing pressure-retaining items when NBIC Part 1, is mandated by a Jurisdiction. Otherwise, the requirements specified in NBIC Part 1, provide information and guidance for installers, contractors, owners, inspectors, and jurisdictions to ensure safe and satisfactory installation of specified pressure-retaining items. Jurisdictions may require other safety standards, including following manufacturer's recommendations. When a Jurisdiction establishes different requirements or where a conflict exists, the rules of the Jurisdiction prevail. Users of NBIC Part 1 are cautioned that other requirements may apply for a particular installation and NBIC Part 1, is not a substitute for sound engineering evaluations.

1.2 PURPOSE

- a) The purpose of these rules is to establish minimum requirements, which, if followed, will ensure that pressure-retaining items, when installed, may be safely operated, inspected, and maintained.
- b) It should be recognized that many of the requirements included in these rules must be considered in the design of the pressure-retaining item by the manufacturer. However, the owner-user is responsible for ensuring that the installation complies with all the applicable requirements contained herein. Further, the installer is responsible for complying with the applicable sections when performing work on behalf of the owner-user.

1.3 APPLICATION OF THESE RULES

- a) As referenced in lower case letters, the terms "owner," "user," or "owner-user" means any person, firm, or corporation legally responsible for the safe operation of the boiler, pressure vessel, piping, or other pressure-retaining item. Further, where the term "owner" is used, it shall mean the owner, or user, or the owner's or user's designee.
- b) Where the owner is required to perform an activity, it is intended that the owner or the owner's designee may perform the activity; however, the owner retains responsibility for compliance with these rules.
- c) These rules refer to documentation obtained from the Jurisdiction (installation permit, operating permit). It is not intended to require the Jurisdiction to issue such permits but rather a caution to owners and installers that such permits may be required.

1.4 CERTIFICATION, INSPECTION, AND JURISDICTIONAL REQUIREMENTS

1.4.1 RESPONSIBILITY

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PART 2, INSPECTION

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Foreword

The National Board of Boiler and Pressure Vessel Inspectors is an organization comprised of Chief Inspectors for the states, cities, and territories of the United States and provinces and territories of Canada. It is organized for the purpose of promoting greater safety to life and property by securing concerted action and maintaining uniformity in post-construction activities of pressure-retaining items, thereby ensuring acceptance and interchangeability among Jurisdictional authorities responsible for the administration and enforcement of various codes and standards.

In keeping with the principles of promoting safety and maintaining uniformity, the National Board originally published The NBIC in 1946, establishing rules for inspection and repairs to boilers and pressure vessels. The National Board Inspection Code (NBIC) Committee is charged with the responsibility for maintaining and revising the NBIC. In the interest of public safety, the NBIC Committee decided, in 1995, to revise the scope of the NBIC to include rules for installation, inspection, and repair or alteration to boilers, pressure vessels, piping, and nonmetallic materials.

In 2007, the NBIC was restructured into three Parts specifically identifying important post-construction activities involving safety of pressure-retaining items. This restructuring provides for future expansion, transparency, and uniformity, ultimately improving public safety.

The NBIC Committee's function is to establish rules of safety governing post-construction activities for the installation, inspection and repair and alteration of pressure-retaining items, and to interpret these rules when questions arise regarding their intent. In formulating the rules, the NBIC Committee considers the needs and concerns of individuals and organizations involved in the safety of pressure-retaining items. The objective of the rules is to afford reasonably certain protection of life and property, so as to give a reasonably long, safe period of usefulness. Advancements in design and material and the evidence of experience are recognized.

The rules established by the NBIC Committee are not to be interpreted as approving, recommending, or endorsing any proprietary or specific design, or as limiting in any way an organization's freedom to choose any method that conforms to the NBIC rules.

The NBIC Committee meets regularly to consider revisions of existing rules, formulation of new rules, and respond to requests for interpretations. Requests for interpretation must be addressed to the NBIC Secretary in writing and must give full particulars in order to receive Committee consideration and a written reply. Proposed revisions to the Code resulting from inquiries will be presented to the NBIC Committee for appropriate action.

Proposed revisions to the Code approved by the NBIC Committee are submitted to the American National Standards Institute and published on the National Board Web site to invite comments from all interested persons. After the allotted time for public review and final approval the new edition is published.

Organizations or users of pressure-retaining items are cautioned against making use of revisions that are less restrictive than former requirements without having assurance that they have been accepted by the Jurisdiction where the pressure-retaining item is installed.

The general philosophy underlying the NBIC is to parallel those provisions of the original code of construction, as they can be applied to post-construction activities.

The NBIC does not contain rules to cover all details of post-construction activities. Where complete details are not given, it is intended that individuals or organizations, subject to the acceptance of the Inspector and Jurisdiction when applicable, provide details for post-construction activities that will be as safe as otherwise provided by the rules in the original Code of Construction.

Activities not conforming to the rules of the original code of construction or the NBIC must receive specific approval of the Jurisdiction, who may establish requirements for design, construction, inspection, testing, and documentation.

There are instances where the NBIC serves to warn against pitfalls; but the Code is not a handbook, and cannot substitute for education, experience, and sound engineering judgment.

It is intended that this Edition of the NBIC and not be retroactive. Unless the Jurisdiction imposes the use of an earlier edition, the latest effective edition is the governing document.

Introduction

It is the purpose of the National Board Inspection Code (NBIC) to maintain the integrity of pressure-retaining items by providing rules for installation, and after the items have been placed into service, by providing rules for inspection and repair and alteration, thereby ensuring that these items may continue to be safely used.

The NBIC is intended to provide rules, information and guidance to manufacturers, Jurisdictions, inspectors, owner-users, installers, contractors, and other individuals and organizations performing or involved in post-construction activities, thereby encouraging the uniform administration of rules pertaining to pressure-retaining items.

Scope

The NBIC recognizes three important areas of post-construction activities where information, understanding, and following specific requirements will promote public and personal safety. These areas include:

- Installation
- Inspection
- Repairs and Alterations

The NBIC provides rules, information, and guidance for post-construction activities, but does not provide details for all conditions involving pressure-retaining items. Where complete details are not provided in this Code, the Code user is advised to seek guidance from the Jurisdiction and from other technical sources.

The words shall, should, and may are used throughout the NBIC and have the following intent:

- Shall – action that is mandatory and required.
- Should – indicates a preferred but not mandatory means to accomplish the requirement unless specified by others such as the Jurisdiction.
- May – permissive, not required or a means to accomplish the specified task.

Organization

The NBIC is organized into three Parts to coincide with specific post-construction activities involving pressure-retaining items. Each Part provides general and specific rules, information, and guidance within each applicable post-construction activity. Other NBIC Parts or other published standards may contain additional information or requirements needed to meet the rules of the NBIC. Specific references are provided in each Part to direct the user where to find this additional information. NBIC Parts are identified as:

- Part 1, Installation – This Part provides requirements and guidance to ensure all types of pressure-retaining items are installed and function properly. Installation includes meeting specific safety criteria for construction, materials, design, supports, safety devices, operation, testing, and maintenance.
- Part 2, Inspection – This Part provides information and guidance needed to perform and document inspections for all types of pressure-retaining items. This Part includes information on personnel safety, non-destructive examination, tests, failure mechanisms, types of pressure equipment, fitness for service, risk-based assessments, and performance-based standards.

- Part 3, Repairs and Alterations – This Part provides information and guidance to perform, verify, and document acceptable repairs or alterations to pressure-retaining items regardless of code of construction. Alternative methods for examination, testing, heat treatment, etc., are provided when the original code of construction requirements cannot be met. Specific acceptable and proven repair methods are also provided.

Each NBIC Part is divided into major Sections as outlined in the Table of Contents.

Tables, charts, and figures provide relevant illustrations or supporting information for text passages, and are designated with numbers corresponding to the paragraph they illustrate or support within each Section. Multiple tables, charts, or figures referenced by the same paragraph will have additional letters reflecting the order of reference. Tables, charts, and figures are located in or after each major Section within each NBIC Part.

Text Identification and Numbering

Each page in the text will be designated in the top header with the publication's name, part number, and part title. The numbering sequence for each section begins with the section number followed by a dot to further designate major sections (e.g., 1.1, 1.2, 1.3). Major sections are further subdivided using dots to designate subsections within that major section (e.g., 1.1.1, 1.2.1, 1.3.1). Subsections can further be divided as necessary.

Paragraphs under sections or subsections shall be designated with small letters in parenthesis (e.g., a), b), c)) and further subdivided using numbers in parenthesis (e.g., 1), 2), 3)). Subdivisions of paragraphs beyond this point will be designated using a hierarchical sequence of letters and numbers followed by a dot.

Example: 2.1 Major Section
 2.1.1 Section
 2.1.2 Section
 2.1.2. Subsection
 a) paragraph
 b) paragraph
 1) subparagraph
 2) subparagraph
 a. subdivisions
 1. subdivisions
 2. subdivisions
 b. subdivisions
 1. subdivisions
 2. subdivisions

Tables and figures will be designated with the referencing section or subsection identification. When more than one table or figure is referenced in the same section or subsection, letters or numbers in sequential order will be used following each section or subsection identification.

Supplements

Supplements are contained in each Part of the NBIC to designate information only pertaining to a specific type of pressure-retaining item (e.g., Locomotive Boilers, Historical Boilers, Graphite Pressure Vessels.) Supplements follow the same numbering system used for the main text only preceded by the Letter “S.” Each page of the supplement will identify the supplement number and name in the top heading.

Interpretations

On request, the NBIC Committee will render an interpretation of any requirement of this Code. Interpretations are provided for each Part and are specific to the Code edition and addenda referenced in the interpretation. Interpretations provide information only and are not part of this Code.

Jurisdictional Precedence

Reference is made throughout this Code to the requirements of the “Jurisdiction.” Where any provision herein presents a direct or implied conflict with any jurisdictional regulation, the Jurisdictional regulation shall govern.

Units of Measurement

Both U.S. customary units and metric units are used in the NBIC. The value stated in U.S. customary units or metric units are to be regarded separately as the standard. Within the text, the metric units are shown in parentheses. In Supplement 6, Parts 2 and 3 Continued Service and Inspection of DOT Transport Tanks, the metric units are shown first with the U.S. customary units shown in parentheses.

U.S. customary units or metric units may be used with this edition of the NBIC, but one system of units shall be used consistently throughout a repair or alteration of pressure-retaining items. It is the responsibility of National Board accredited repair organizations to ensure the appropriate units are used consistently throughout all phases of work. This includes materials, design, procedures, testing, documentation, and stamping. The NBIC policy for metrication is outlined in each part of the NBIC.

Accreditation Programs

The National Board administers and accredits three specific repair programs¹ as shown below:

- “R” Repairs and Alterations to Pressure-Retaining Items
- “VR” Repairs to Pressure Relief Valves
- “NR” Repair and Replacement Activities for Nuclear Items

Part 3, Repairs and Alterations, of the NBIC describes the administrative requirements for the accreditation of these repair organizations.

The National Board also administers and accredits four specific inspection agency programs as shown below:

New Construction

Criteria for Acceptance of Authorized Inspection Agencies for New Construction
(NB-360)

Inservice

Qualifications and Duties for Authorized Inspection Agencies (AIAs) Performing In-service Inspection Activities and Qualifications for Inspectors of Boilers and Pressure Vessels
(NB-369)

Owner-User

Accreditation of Owner-User Inspection Organizations (OUIO) (NB-371) Owners or users may be accredited for both a repair and inspection program provided the requirements for each accreditation program are met.

Federal Government

Qualifications and Duties for Federal Inspection Agencies Performing Inservice Inspection Activities (FIAs) (NB-390)

These programs can be viewed on the National Board Web site. For questions or further information regarding these programs contact:

The National Board of Boiler and Pressure Vessel Inspectors
1055 Crupper Avenue
Columbus, OH 43229-1183
Phone — 614.888.8320
Fax — 614.847.1828
Web site — www.nationalboard.org

Certificates of Authorization for Accreditation Programs

Any organization seeking an accredited program may apply to the National Board to obtain a Certificate of Authorization for the requested scope of activities. A confidential review shall be conducted to evaluate the organization’s quality system. Upon completion of the evaluation, a recommendation will be made to the National Board regarding issuance of a Certificate of Authorization.

Certificate of Authorization scope, issuance, and revisions for National Board accreditation programs are specified in the applicable National Board procedures. When the quality system requirements of the appropriate accreditation program have been met, a Certificate of Authorization and appropriate National Board symbol stamp shall be issued.

¹ Caution, some Jurisdictions may independently administer a program of authorization for organizations to perform repairs and alterations within that Jurisdiction.

2011 **NBIC**

PART 2, INSPECTION

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2011 NBIC
PART 2, SECTION 1
INSPECTION – GENERAL REQUIREMENTS
FOR INSERVICE INSPECTION OF
PRESSURE-RETAINING ITEMS

PART 2, SECTION 1

INSPECTION — GENERAL REQUIREMENTS FOR INSERVICE INSPECTION OF PRESSURE-RETAINING ITEMS

1.1 SCOPE

This section provides general guidelines and requirements for conducting inservice inspection of pressure-retaining items. Appropriately, this Section includes precautions for the safety of inspection personnel. The safety of the public and the Inspector is the most important aspect of any inspection activity.

1.2 ADMINISTRATION

Jurisdictional requirements describe the frequency, scope, type of inspection, whether internal, external, or both, and type of documentation required for the inspection. The Inspector shall have a thorough knowledge of jurisdictional regulations where the item is installed, as jurisdictional or regulatory inspection requirements do vary.

1.3 REFERENCE TO OTHER CODES AND STANDARDS

Other existing inspection codes, standards, and practices pertaining to the inservice inspection of pressure-retaining items can provide useful information and references relative to the inspection techniques listed in this Part. Some examples are as follows:

- a) National Board *Bulletin* — National Board Classic Articles Series;
- b) American Society of Mechanical Engineers — *ASME Boiler and Pressure Vessel Code* Section V (Non-destructive Examination);
- c) American Society of Mechanical Engineers — *ASME Boiler and Pressure Vessel Code* Section VI (*Recommended Rules for the Care and Operation of Heating Boilers*);
- d) American Society of Mechanical Engineers — *ASME Boiler and Pressure Vessel Code* Section VII (*Recommended Guidelines for the Care of Power Boilers*);
- e) American Society of Mechanical Engineers — ASME B31G (*Manual for Determining the Remaining Strength of Corroded Pipelines*);
- A11 f) American Petroleum Institute — API 510, *Pressure Vessel Inspection Code: In-Service Inspection, Rating, Repair and Alteration*;
- g) American Petroleum Institute — API 572, *Inspection of Pressure Vessels*;
- h) American Petroleum Institute — API 574, *Inspection Practices for Piping System Components*;
- i) American Petroleum Institute — API 579 *Fitness-For-Service*;
- j) ASME CRTD Volume 41, *Risk-Based Inspection for Equipment Life Management: An Application Handbook*;
- k) API Recommended Practice 580, *Risk-Based Inspection*; and

2011 NBIC

PART 3, REPAIRS AND ALTERATIONS

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National Board Inspection Code 2011 Edition Date of Issue — July 31, 2011

This code was developed under procedures accredited as meeting the criteria for American National Standards. The Consensus Committee that approved the code was balanced to ensure that individuals from competent and concerned interests had an opportunity to participate. The proposed code was made available for public review and comment, which provided an opportunity for additional public input from industry, academia, regulatory and jurisdictional agencies, and the public-at-large.

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The National Board accepts responsibility for only those interpretations issued in accordance with governing National Board procedures and policies that preclude the issuance of interpretations by individual committee members.

The footnotes in this document are part of this American National Standard.



The above National Board symbols are registered with the US Patent Office.

“National Board” is the abbreviation for The National Board of Boiler and Pressure Vessel Inspectors.

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Foreword

The National Board of Boiler and Pressure Vessel Inspectors is an organization comprised of Chief Inspectors for the states, cities, and territories of the United States and provinces and territories of Canada. It is organized for the purpose of promoting greater safety to life and property by securing concerted action and maintaining uniformity in post-construction activities of pressure-retaining items, thereby ensuring acceptance and interchangeability among Jurisdictional authorities responsible for the administration and enforcement of various codes and standards.

In keeping with the principles of promoting safety and maintaining uniformity, the National Board originally published The NBIC in 1946, establishing rules for inspection and repairs to boilers and pressure vessels. The National Board Inspection Code (NBIC) Committee is charged with the responsibility for maintaining and revising the NBIC. In the interest of public safety, the NBIC Committee decided, in 1995, to revise the scope of the NBIC to include rules for installation, inspection, and repair or alteration to boilers, pressure vessels, piping, and nonmetallic materials.

In 2007, the NBIC was restructured into three Parts specifically identifying important post-construction activities involving safety of pressure-retaining items. This restructuring provides for future expansion, transparency, and uniformity, ultimately improving public safety.

The NBIC Committee's function is to establish rules of safety governing post-construction activities for the installation, inspection and repair and alteration of pressure-retaining items, and to interpret these rules when questions arise regarding their intent. In formulating the rules, the NBIC Committee considers the needs and concerns of individuals and organizations involved in the safety of pressure-retaining items. The objective of the rules is to afford reasonably certain protection of life and property, so as to give a reasonably long, safe period of usefulness. Advancements in design and material and the evidence of experience are recognized.

The rules established by the NBIC Committee are not to be interpreted as approving, recommending, or endorsing any proprietary or specific design, or as limiting in any way an organization's freedom to choose any method that conforms to the NBIC rules.

The NBIC Committee meets regularly to consider revisions of existing rules, formulation of new rules, and respond to requests for interpretations. Requests for interpretation must be addressed to the NBIC Secretary in writing and must give full particulars in order to receive Committee consideration and a written reply. Proposed revisions to the Code resulting from inquiries will be presented to the NBIC Committee for appropriate action.

Proposed revisions to the Code approved by the NBIC Committee are submitted to the American National Standards Institute and published on the National Board Web site to invite comments from all interested persons. After the allotted time for public review and final approval the new edition is published.

Organizations or users of pressure-retaining items are cautioned against making use of revisions that are less restrictive than former requirements without having assurance that they have been accepted by the Jurisdiction where the pressure-retaining item is installed.

The general philosophy underlying the NBIC is to parallel those provisions of the original code of construction, as they can be applied to post-construction activities.

The NBIC does not contain rules to cover all details of post-construction activities. Where complete details are not given, it is intended that individuals or organizations, subject to the acceptance of the Inspector and Jurisdiction when applicable, provide details for post-construction activities that will be as safe as otherwise provided by the rules in the original Code of Construction.

Activities not conforming to the rules of the original code of construction or the NBIC must receive specific approval of the Jurisdiction, who may establish requirements for design, construction, inspection, testing, and documentation.

There are instances where the NBIC serves to warn against pitfalls; but the Code is not a handbook, and cannot substitute for education, experience, and sound engineering judgment.

It is intended that this Edition of the NBIC not be retroactive. Unless the Jurisdiction imposes the use of an earlier edition, the latest effective edition is the governing document.

Introduction

It is the purpose of the National Board Inspection Code (NBIC) to maintain the integrity of pressure-retaining items by providing rules for installation, and after the items have been placed into service, by providing rules for inspection and repair and alteration, thereby ensuring that these items may continue to be safely used.

The NBIC is intended to provide rules, information and guidance to manufacturers, Jurisdictions, inspectors, owner-users, installers, contractors, and other individuals and organizations performing or involved in post-construction activities, thereby encouraging the uniform administration of rules pertaining to pressure-retaining items.

Scope

The NBIC recognizes three important areas of post-construction activities where information, understanding, and following specific requirements will promote public and personal safety. These areas include:

- Installation
- Inspection
- Repairs and Alterations

The NBIC provides rules, information, and guidance for post-construction activities, but does not provide details for all conditions involving pressure-retaining items. Where complete details are not provided in this Code, the Code user is advised to seek guidance from the Jurisdiction and from other technical sources.

The words shall, should, and may are used throughout the NBIC and have the following intent:

- Shall – action that is mandatory and required.
- Should – indicates a preferred but not mandatory means to accomplish the requirement unless specified by others such as the Jurisdiction.
- May – permissive, not required or a means to accomplish the specified task.

Organization

The NBIC is organized into three Parts to coincide with specific post-construction activities involving pressure-retaining items. Each Part provides general and specific rules, information, and guidance within each applicable post-construction activity. Other NBIC Parts or other published standards may contain additional information or requirements needed to meet the rules of the NBIC. Specific references are provided in each Part to direct the user where to find this additional information. NBIC Parts are identified as:

- Part 1, Installation – This Part provides requirements and guidance to ensure all types of pressure-retaining items are installed and function properly. Installation includes meeting specific safety criteria for construction, materials, design, supports, safety devices, operation, testing, and maintenance.
- Part 2, Inspection – This Part provides information and guidance needed to perform and document inspections for all types of pressure-retaining items. This Part includes information on personnel safety, non-destructive examination, tests, failure mechanisms, types of pressure equipment, fitness for service, risk-based assessments, and performance-based standards.

- Part 3, Repairs and Alterations – This Part provides information and guidance to perform, verify, and document acceptable repairs or alterations to pressure-retaining items regardless of code of construction. Alternative methods for examination, testing, heat treatment, etc., are provided when the original code of construction requirements cannot be met. Specific acceptable and proven repair methods are also provided.

Each NBIC Part is divided into major Sections as outlined in the Table of Contents.

Tables, charts, and figures provide relevant illustrations or supporting information for text passages, and are designated with numbers corresponding to the paragraph they illustrate or support within each Section. Multiple tables, charts, or figures referenced by the same paragraph will have additional letters reflecting the order of reference. Tables, charts, and figures are located in or after each major Section within each NBIC Part.

Text Identification and Numbering

Each page in the text will be designated in the top header with the publication's name, part number, and part title. The numbering sequence for each section begins with the section number followed by a dot to further designate major sections (e.g., 1.1, 1.2, 1.3). Major sections are further subdivided using dots to designate subsections within that major section (e.g., 1.1.1, 1.2.1, 1.3.1). Subsections can further be divided as necessary.

Paragraphs under sections or subsections shall be designated with small letters in parenthesis (e.g., a), b), c)) and further subdivided using numbers in parenthesis (e.g., 1), 2), 3)). Subdivisions of paragraphs beyond this point will be designated using a hierarchical sequence of letters and numbers followed by a dot.

Example: 2.1 Major Section
 2.1.1 Section
 2.1.2 Section
 2.1.2. Subsection
 a) paragraph
 b) paragraph
 1) subparagraph
 2) subparagraph
 a. subdivisions
 1. subdivisions
 2. subdivisions
 b. subdivisions
 1. subdivisions
 2. subdivisions

Tables and figures will be designated with the referencing section or subsection identification. When more than one table or figure is referenced in the same section or subsection, letters or numbers in sequential order will be used following each section or subsection identification.

Supplements

Supplements are contained in each Part of the NBIC to designate information only pertaining to a specific type of pressure-retaining item (e.g., Locomotive Boilers, Historical Boilers, Graphite Pressure Vessels.) Supplements follow the same numbering system used for the main text only preceded by the Letter “S.” Each page of the supplement will identify the supplement number and name in the top heading.

Interpretations

On request, the NBIC Committee will render an interpretation of any requirement of this Code. Interpretations are provided for each Part and are specific to the Code edition and addenda referenced in the interpretation. Interpretations provide information only and are not part of this Code.

Jurisdictional Precedence

Reference is made throughout this Code to the requirements of the “Jurisdiction.” Where any provision herein presents a direct or implied conflict with any jurisdictional regulation, the Jurisdictional regulation shall govern.

Units of Measurement

Both U.S. customary units and metric units are used in the NBIC. The value stated in U.S. customary units or metric units are to be regarded separately as the standard. Within the text, the metric units are shown in parentheses. In supplement 6, Parts 2 and 3, Continued Service and Inspection of DOT Transport Tanks, the metric units are shown first with the U.S. customary units shown in parentheses.

U.S. customary units or metric units may be used with this edition of the NBIC, but one system of units shall be used consistently throughout a repair or alteration of pressure-retaining items. It is the responsibility of National Board accredited repair organizations to ensure the appropriate units are used consistently throughout all phases of work. This includes materials, design, procedures, testing, documentation, and stamping. The NBIC policy for metrication is outlined in each part of the NBIC.

Accreditation Programs

The National Board administers and accredits three specific repair programs¹ as shown below:

- “R” Repairs and Alterations to Pressure-Retaining Items
- “VR” Repairs to Pressure Relief Valves
- “NR” Repair and Replacement Activities for Nuclear Items

Part 3, Repairs and Alterations, of the NBIC describes the administrative requirements for the accreditation of these repair organizations.

The National Board also administers and accredits four specific inspection agency programs as shown below:

New Construction

Criteria for Acceptance of Authorized Inspection Agencies for New Construction
(NB-360)

Inservice

Qualifications and Duties for Authorized Inspection Agencies (AIAs) Performing In-service Inspection Activities and Qualifications for Inspectors of Boilers and Pressure Vessels
(NB-369)

Owner-User

Accreditation of Owner-User Inspection Organizations (OUIO) (NB-371) Owners or users may be accredited for both a repair and inspection program provided the requirements for each accreditation program are met.

Federal Government

Qualifications and Duties for Federal Inspection Agencies Performing Inservice Inspection Activities (FIAs) (NB-390)

These programs can be viewed on the National Board Web site. For questions or further information regarding these programs contact:

The National Board of Boiler and Pressure Vessel Inspectors
1055 Crupper Avenue
Columbus, OH 43229-1183
Phone — 614.888.8320
Fax — 614.847.1828
Web site — www.nationalboard.org

Certificates of Authorization for Accreditation Programs

Any organization seeking an accredited program may apply to the National Board to obtain a Certificate of Authorization for the requested scope of activities. A confidential review shall be conducted to evaluate the organization’s quality system. Upon completion of the evaluation, a recommendation will be made to the National Board regarding issuance of a Certificate of Authorization.

Certificate of Authorization scope, issuance, and revisions for National Board accreditation programs are specified in the applicable National Board procedures. When the quality system requirements of the appropriate accreditation program have been met, a Certificate of Authorization and appropriate National Board symbol stamp shall be issued.

¹ Caution, some Jurisdictions may independently administer a program of authorization for organizations to perform repairs and alterations within that Jurisdiction.

2011 **NBIC**

PART 3, REPAIRS AND ALTERATIONS

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PART 3 — REPAIRS AND ALTERATIONS

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PART 3, SECTION 1
**REPAIRS AND ALTERATIONS – General and
Administrative Requirements**

PART 3, SECTION 1

REPAIRS AND ALTERATIONS — GENERAL AND ADMINISTRATIVE REQUIREMENTS

1.1 SCOPE

- a) This part provides general requirements that apply when performing repairs and alterations to pressure-retaining items.
- b) This part describes the administrative requirements for the accreditation of repair organizations.¹
- c) The National Board administers three specific accreditation programs:
 - “R” — Repairs and Alterations to Pressure-Retaining Items
 - “VR” — Repairs to Pressure Relief Valves
 - “NR” — Repair and Replacement Activities for Nuclear Items

1.2 CONSTRUCTION STANDARDS FOR PRESSURE-RETAINING ITEMS

- a) When the standard governing the original construction is the ASME Code or ASME RTP-1, repairs and alterations to pressure-retaining items shall conform, insofar as possible, to the section and edition of the ASME Code most applicable to the work planned.
- b) If the pressure-retaining item was not constructed to a construction code or standard, or when the standard governing the original construction is not the ASME Code or ASME RTP-1, repairs or alterations shall conform, insofar as possible, to the edition of the construction standard or specification most applicable to the work. Where this is not possible or practicable, it is permissible to use other codes, standards, or specifications, including the ASME Code or ASME RTP-1, provided the “R” Certificate Holder has the concurrence of the Inspector and the Jurisdiction where the pressure-retaining item is installed.
- c) For historical boilers, the 1971 Edition of Section I of ASME Boiler Code, Part PR and PFT provides the many pressure-related components and features of construction encountered in firetube boilers.
- d) For pressure relieving devices the applicable standard for new valves to be used for reference during repairs is the ASME Code. ASME Code Cases shall be used for repairs when they were used in the original construction of the valve. ASME Code Cases may be used when they have been accepted for use by the NBIC committee and the Jurisdiction where the pressure-retaining item is installed.
 - 1) For pressure relieving devices the code case number shall be noted on the repair document and, when required by the code case, stamped on the repair nameplate.
 - 2) The Jurisdiction where the pressure-retaining item is installed shall be consulted for any unique requirements it may have established.

¹ Caution: Some jurisdictions may independently administer a program of authorization for organizations to perform repairs and alterations within that Jurisdiction.

- e) Piping systems are designed for a variety of service conditions such as steam, water, oil, gas, or air. Design requirements for repairs and alterations are to meet the original code of construction or the code most appropriate for the repair or alteration. These systems shall be designed for the most severe conditions of pressure, temperature, loadings, and expected transients considered for normal operation. All pipe materials, fittings, and valves shall be rated for the maximum service conditions for normal operation. Design corrosion of piping systems should also be considered when determining types of materials and thicknesses.

1.3 INSPECTOR

- a) Inspection and certification shall be made by an Inspector holding the appropriate commission issued by the National Board and employed by an Authorized Inspection Agency (see 9.0, *Glossary of Terms*, for definition of Authorized Inspection Agency). A11
- b) An Inspector employed by an Owner-User Inspection Organization or a Federal Inspection Agency may authorize and accept work only on pressure-retaining items owned or used by the respective organization. Each accredited Owner-User Inspection Organization's quality program shall have specific approval of the Jurisdiction as required.

1.3.1 AUTHORIZATION

- a) The Inspector's authorization to perform a repair or alteration shall be obtained by the repair organization prior to initiation of a repair or alteration to a pressure-retaining item. The Inspector shall determine that the repair or alteration methods are acceptable.
- b) Subject to acceptance of the Jurisdiction, the Inspector may give approval for routine repairs prior to the start of work provided the Inspector ensures that the "R" Certificate Holder has adequately addressed routine repairs in the quality program.

1.3.2 ACCEPTANCE INSPECTION

- a) The Inspector making the acceptance inspection shall be the same Inspector who authorized the repair or alteration. Where this is not possible or practicable, another Inspector may perform the acceptance inspection; however, in all cases, the Inspector who performs the acceptance inspection shall be an employee of the same organization as the Inspector who authorized the repair or alteration.
- b) Before signing the appropriate NBIC Report Form, the Inspector shall review the drawings, ensure the repair or alteration was performed in accordance with the accepted code of construction or standard, witness any pressure test or any acceptable alternative test method applied, ensure that the required nondestructive examinations have been performed satisfactorily, and that the other functions necessary to ensure compliance with the requirements of this Code have been satisfactorily performed.

1.4 DEFINITIONS RELATING TO PRESSURE RELIEF DEVICES

Unless otherwise specified in these rules and procedures, the definitions relating to pressure relief devices in Section 2 of ANSI/ASME PTC-25-2001 shall apply.

1.5 ACCREDITATION

- a) Organizations performing repairs or alterations to pressure-retaining items shall be accredited as described in this section, as appropriate for the scope of work to be performed.
- b) Organizations performing repairs outside the scope of the NBIC may be accredited and shall meet any additional requirements of the Jurisdiction where the work is performed.

1.5.1 ACCREDITATION PROCESS

- a) The National Board administers accreditation programs for authorization of organizations performing repairs and alterations to pressure-retaining items and/or pressure relief valves.
- b) Any organization may apply to the National Board to obtain a *Certificate of Authorization* for the requested scope of activities. A review shall be conducted to evaluate the organization's quality system. The individual assigned to conduct the evaluation shall meet the qualification requirements prescribed by the National Board. Upon completion of the evaluation, any deficiencies within the organization's quality system will be documented and a recommendation will be made to the National Board regarding issuance of a *Certificate of Authorization*.
- c) As part of the accreditation process, an applicant's quality system is subject to a review. National Board procedures provide for the confidential review resulting in recommendations to issue or not issue a *Certificate of Authorization*.
- d) When the quality system requirements of this Section have been met, a *Certificate of Authorization* and appropriate National Board symbol stamp shall be issued.
- e) The accreditation programs provide requirements for organizations performing repairs and alterations to pressure-retaining items. Depending upon the expected scope of activities at the time of review, organizations may be authorized to perform design only, metallic or non-metallic repairs, and/or alterations either in the shop only, field only, or shop and field. Repairs and/or alterations to metallic and non-metallic pressure-retaining items are made by welding, bonding and/or mechanical assembly.

1.5.2 SCOPE ISSUANCE AND REVISION TO A QUALITY SYSTEM

- a) Any scope revision shall require authorized inspection agency acceptance of quality system changes. These changes shall be submitted to the National Board for acceptance. A program review may be required by the National Board or the Jurisdiction to ensure quality system requirements are met for scope changes. Upon acceptance of the changes, the National Board will issue a *Certificate of Authorization* with a revised scope.
- b) The "VR" accreditation program provides requirements for organizations performing repairs to pressure relief valves. For scope issuance and revisions, refer to NBIC Part 3,1.7.

1.6 ACCREDITATION OF “R” REPAIR ORGANIZATIONS

1.6.1 SCOPE

- a) This section provides requirements that shall be met by organizations in order to obtain a National Board *Certificate of Authorization* to use the “R” Symbol Stamp for the repair or alteration of pressure-retaining items. Organizations may be authorized to perform repairs only, or repairs and alterations.
- b) The issuance of the “R” Stamp is not restricted to organizations whose primary business is to repair and alter pressure-retaining items, nor to manufacturers of pressure-retaining items. Owners and users of pressure-retaining items and other organizations that qualify in accordance with these rules may also obtain the “R” Stamp.
- c) Owners or users may be accredited for both a repair and inspection program provided the owner or user complies with the requirements of the “R” program and the National Board requirements of NB-371 for an Owner-User Inspection Organization. The requirements of NBIC Part 3, 1.6.2(a) do not apply if the owner or user chooses to use the Owner-User Inspection Organization to accept the repair quality system when:
 - 1) There is no conflict with jurisdictional requirements.
 - 2) The line of authority for the Owner-User Inspection Organization shall be independent of the organization responsible for execution of “R” program work.
 - 3) The process and Inspector limitations are described in the written Owner-User Inspection Organization’s quality system manual.

1.6.2 PREREQUISITES FOR ISSUING A NATIONAL BOARD CERTIFICATE OF AUTHORIZATION

Before an organization can obtain a National Board “R” *Certificate of Authorization*, the organization shall:

- a) Have and maintain an Inspection Agreement with an Authorized Inspection Agency;
- b) Have, in the English language, a written Quality System that complies with the requirements of this section and includes the expected scope of activities;
- c) Have the current edition and addendum of the *National Board Inspection Code*, all parts; and
- d) Have available a copy of the code of construction appropriate to the intended scope of work.

1.6.3 PROCEDURE FOR OBTAINING OR RENEWING A NATIONAL BOARD CERTIFICATE OF AUTHORIZATION

- a) Prior to issuance or renewal of a National Board “R” *Certificate of Authorization*, the organization and its facilities are subject to a review of their Quality System. The implementation of the Quality System shall be satisfactorily demonstrated by the organization. The National Board reserves the absolute right to cancel, refuse to issue, or renew such authorization.

- b) Organizations desiring to renew or obtain a National Board *Certificate of Authorization* shall apply to the National Board using forms obtained from the National Board. Application for renewal shall be made prior to the expiration date of the *Certificate of Authorization*.
- c) When an organization has plants or shops in more than one location, the organization shall submit separate applications for each plant or shop. The organization may perform repairs or alterations in its plants, shops, or in the field, provided such operations are described in the organization's Quality System.
- d) Upon notification of the review dates from the National Board, it is the responsibility of the organization to make arrangements for the review.
- e) The Review Team, as a minimum, shall consist of one representative each from the Authorized Inspection Agency and the Jurisdiction.²
- f) The Review Team shall conduct an evaluation of the organization's Quality System. The organization shall demonstrate sufficient implementation of the Quality System to provide evidence of the organization's knowledge of welding, nondestructive examination, postweld heat treatment, and other repair or alteration activities performed appropriate for the requested scope of work. The demonstration shall be performed using current work, a demonstration mock-up, or a combination of both.
- g) A recommendation to issue, renew, or withhold the National Board *Certificate of Authorization* shall be included in a Review Report prepared by the Review Team. The completed Review Report shall be forwarded to the National Board.
- h) If proper administrative fees are paid and all other requirements are met, a *Certificate of Authorization* will be issued evidencing permission to use the "R" Symbol Stamp. The certificate shall expire on the triennial anniversary date.
- i) When an organization holding a National Board *Certificate of Authorization* changes ownership, name, location, or address, the National Board shall be notified. The *Certificate of Authorization* may be revised by submitting an application for National Board "R" *Certificate of Authorization*; however, a re-review may be required.
- j) The holder of an ASME Code Symbol Stamp, whose facilities were reviewed (with the exception of "V," "UV," "HV," "NV," and "H" [cast iron or cast aluminum]) may obtain National Board authorization without a review of its facilities, provided:
 - 1) The organization has a Quality System to cover the scope of the repairs or alterations to be made, subject to review by the Jurisdiction; and
 - 2) The application for the "R" *Certificate of Authorization* is submitted within 12 months from the issuance of the ASME *Certificate of Authorization*. The initial *Certificate of Authorization* shall be issued to expire concurrent with the ASME *Certificate of Authorization*. Subsequent certificates shall be renewed upon a successful review and implementation of its Quality System by a National Board Representative.
- k) The Jurisdiction may audit the Quality System and activities of an organization upon a valid request from an owner, user, inspection agency, or the National Board.

² Jurisdiction: The National Board member jurisdiction where the organization is located. Alternatively, where the Jurisdiction elects not to perform the review or where there is no Jurisdiction or where the Jurisdiction is the organization's Authorized Inspection Agency, the National Board of Boiler and Pressure Vessel Inspectors will represent the Jurisdiction. At the Jurisdiction's discretion, the Jurisdiction may choose to be a member of the review team if the Jurisdiction chooses not to be the team leader.

- l) The NBIC Committee may at any time change the rules for the issuance of Certificates of Authorization and use of the “R” Symbol Stamp. These rules shall become binding on all certificate holders.

1.6.4 NATIONAL BOARD “R” SYMBOL STAMP

- a) All “R” Symbol Stamps shall be obtained from the National Board of Boiler and Pressure Vessel Inspectors. Authorization to use the “R” Symbol Stamp may be granted by the National Board at its absolute discretion.
- b) The “R” Symbol Stamp is furnished on loan by the National Board for a nominal fee. Each organization shall agree if authorization to use the “R” Symbol Stamp is granted, that the “R” Symbol Stamp is at all times the property of the National Board and will be promptly returned upon demand. If the organization discontinues the use of the “R” Symbol Stamp, inspection agreement with an Authorized Inspection Agency, or if the *Certificate of Authorization* has expired and no new certificate has been issued, the “R” Symbol Stamp shall be returned to the National Board.
- c) The organization’s Quality System shall provide for adequate control of the “R” Symbol Stamp. Provisions may be made for the issuance of the “R” Symbol Stamp for use at various field locations.
- d) The holder of a *Certificate of Authorization* may obtain more than one “R” Symbol Stamp provided the organization’s Quality System describes how the use of such stamps is controlled from the location shown on the certificate.
- e) An organization shall not permit others to use the “R” Symbol Stamp loaned to it by the National Board.

1.6.5 QUALITY SYSTEM

A holder of a National Board *Certificate of Authorization* shall have and maintain a written Quality System. The System shall satisfactorily meet the requirements of the NBIC and shall be available for review. The Quality System may be brief or voluminous, depending on the projected scope of work. It shall be treated confidentially by the National Board.

1.6.5.1 OUTLINE OF REQUIREMENTS FOR A QUALITY SYSTEM FOR QUALIFICATION FOR THE NATIONAL BOARD “R” *CERTIFICATE OF AUTHORIZATION*

The following is a guide for required features of a Quality System which shall be included in the organization’s Quality System Manual. As a minimum, each organization shall address the required features relative to the scope of work to be performed. Organizations shall explain their intent, capability and applicability for each required feature outlined in this section. Work may be subcontracted provided controls are clearly defined for maintaining full responsibility for code compliance by the National Board repair organization certifying the work.

- a) Title Page
The name and complete address of the company to which the National Board *Certificate of Authorization* is issued shall be included on the Title Page of the Quality System Manual.
- b) Contents Page
The manual should contain a page listing the contents of the manual by subject, number (if applicable), and revision number of each document.

- c) **Scope of Work**
The manual shall clearly indicate the scope and type of repairs or alterations the organization is capable of and intends to carry out.
- d) **Statement of Authority and Responsibility**
A dated *Statement of Authority*, signed by an officer of the organization, shall be included in the manual. Further, the *Statement of Authority* shall include:
- 1) A statement that all repairs or alterations carried out by the organization shall meet the requirements of the NBIC and the Jurisdiction, as applicable;
 - 2) A statement that if there is a disagreement in the implementation of the Quality System, the matter is to be referred for resolution to a higher authority in the company;
 - 3) The title of the individual who will be responsible to ensure that 1) above is followed and has the freedom and authority to carry out the responsibility.
- e) **Manual Control**
The manual shall include the necessary provisions for revising and issuing documents to keep the manual current. The title of the individual authorized to approve revisions shall be included in the manual. Revisions must be accepted by the Authorized Inspection Agency prior to issuance of the manual and its implementation.
- f) **Organization**
An organizational chart shall be included in the manual. It shall include the title of the heads of all departments or divisions that perform functions that can affect the quality of the repair or alteration, and it shall show the relationship between each department or division.
- The manual shall identify the title of those individuals responsible for preparation, implementation, or verification of the Quality System. The responsibilities shall be clearly defined and the individuals shall have the organizational freedom and authority to fulfill those responsibilities.
- g) **Drawings, Design and Specifications**
The manual shall contain controls to ensure that all design information, applicable drawings, design calculations, specifications, and instructions are prepared or obtained, controlled, and interpreted in accordance with the original code of construction.
- h) **Repair and Alteration Methods**
The manual shall include controls for repairs and alterations, including mechanical assembly procedures, materials, nondestructive examination methods, pre-heat, and postweld heat treatment, as applicable. Special requirements such as nonmetallic repairs and alterations to graphite and fiber-reinforced thermosetting plastic pressure-retaining items including bonding or mechanical assembly procedures shall be addressed, if applicable.
- i) **Materials**
The manual shall describe the method used to ensure that only acceptable materials (including welding material) are used for repairs and alterations. The manual shall include a description of how existing material is identified and new material is ordered, verified, and identified. The manual shall identify the title of the individual(s) responsible for each function and a brief description of how the function is to be performed.

- j) **Method of Performing Work**
The manual shall describe the methods for performing and documenting repairs and alterations in sufficient detail to permit the Inspector to determine at what stages specific inspections are to be performed. The method of repair or alteration must have prior acceptance of the Inspector.
- k) **Welding, NDE and Heat Treatment**
The manual shall describe controls for welding, nondestructive examination, and heat treatment. The manual is to indicate the title of the individual(s) responsible for the welding procedure specification (WPS) and its qualification, and the qualification of welders and welding operators. It is essential that only welding procedure specifications and welders or welding operators qualified, as required by the NBIC, be used in the repair or alteration of pressure-retaining items. It is also essential that welders and welding operators maintain their proficiency as required by the NBIC, while engaged in the repair or alteration of pressure-retaining items. The manual shall also describe controls for ensuring that the required WPS or Standard Welding Procedure Specification (SWPS) is available to the welder or welding operator prior to welding. Similar responsibility for nondestructive examination and heat treatment shall be described in the manual.
- l) **Examinations and Tests**
Reference shall be made in the manual for examinations and tests upon completion of the repair or alteration.
- m) **Calibration**
The manual shall describe a system for the calibration of examination, measuring, and test equipment used in the performance of repairs and alterations.
- n) **Acceptance and Inspection of Repair or Alteration**
The manual shall specifically indicate that before the work is started, acceptance of the repair/alteration shall be obtained from an Inspector who will make the required inspections and confirm NBIC compliance by signing and dating the applicable NBIC Report Form³ upon completion of the work.
- o) **Inspections**
The manual shall make provisions for the Inspector to have access to all drawings, design calculations, specifications, procedures, process sheets, repair or alteration procedures, test results, and other documents as necessary to ensure compliance with the NBIC. A copy of the current manual shall be available to the inspector.
- p) **Report of Repair or Alteration Form**
The manual shall indicate the title of the individuals responsible for preparing, signing, and presenting the NBIC Report Forms to the Inspector. The distribution of the NBIC Report Forms³ shall be described in the manual.
- q) **Exhibits**
Any forms referenced in the manual shall be included. The form may be a part of the referencing document or included as an appendix. For clarity, the forms may be completed and identified as examples. The name and accepted abbreviations of the “R” Certificate Holder shall be included in the manual.
- r) **Construction Code**
The manual shall include provisions for addressing the requirements that pertain to the specific construction code for the equipment being repaired or altered.

³ NBIC Report Form: National Board Form R-1 for Repairs, Form R-2 for Alterations, Form R-3 for Fabricated Parts, or Form R-4 Report Supplementary Sheet.

s) Nonconforming Items

There shall be a system acceptable to the Inspector for the correction of nonconformities. A nonconformance is any condition that does not comply with the applicable rules of the NBIC, construction code, jurisdictional requirements, or the quality system. Nonconformance must be corrected or eliminated before the repaired or altered component can be considered in compliance with the NBIC.

1.7 ACCREDITATION OF “VR” REPAIR ORGANIZATIONS

1.7.1 SCOPE

- a) These administrative rules and procedures are provided for those who wish to obtain a National Board *Certificate of Authorization* for use of the “VR” (Repair of Pressure Relief Valves) symbol stamp. It should be noted that the issuance of the “VR” stamp is not restricted to companies whose primary business is the repair of pressure relief valves, nor to manufacturers or assemblers that hold an ASME “V,” “HV,” “UV,” or “NV” Code Symbol Stamp. Owners and users of boilers and pressure vessels and other organizations that qualify in accordance with the National Board Rules and Regulations may also obtain the “VR” Certificate and stamp.
- b) In order to provide due process in the issuance, renewal, and revocation of “VR” symbol stamps and certificates of authorization, the National Board Appeals Committee procedures provide an affected “VR” *Certificate of Authorization* applicant the right of appeal, or to provide additional information that may affect the Committee’s decision.

1.7.2 JURISDICTIONAL PARTICIPATION

The National Board member jurisdiction in which the “VR” organization is located is encouraged to participate in the review and demonstration of the applicant’s quality system. The Jurisdiction may require participation in the review of the repair organization and the demonstration and acceptance of the repair organization’s quality system manual.

1.7.3 GENERAL RULES

The general rules of the National Board “VR” certification program apply only to the repair of National Board capacity certified ASME Code Section I, “V” stamped, Section IV, “HV” marked, and Section VIII, “UV” stamped pressure relief valves that:

- a) Have been in service or have been exposed to environmental or other conditions such that there is reason to question their ability to perform equivalent to the standards for new valves; or
- b) Any or all of the valve’s external adjustment seals have been broken, opened, or otherwise disturbed, regardless of the valve’s age or service status.

1.7.4 REPAIR OF NUCLEAR VALVES

Provided that the requirements of Supplement 9 and applicable requirements of these rules are met, the “VR” certificate may be extended to apply to the repair of any ASME Code Section III, Class 1, 2, or 3, pressure relief devices that have been capacity certified by the National Board and have been in service, regardless of their intended function, in a nuclear system.

1.7.5 ISSUANCE AND RENEWAL OF THE “VR” CERTIFICATE OF AUTHORIZATION

1.7.5.1 GENERAL

Authorization to use the stamp bearing the official National Board “VR” symbol as shown in NBIC Part 3, Section 5, will be granted by the National Board pursuant to the provisions of the following administrative rules and procedures. NBIC Part 3, Supplement 9, provides rules for the repair of ASME Section III, “NV” stamped pressure relief devices.

1.7.5.2 ISSUANCE OF CERTIFICATE

- a) Repair organizations, manufacturers, assemblers, or users that make repairs to the American Society of Mechanical Engineers (ASME) Code symbol, stamped or marked (as applicable), and The National Board of Boiler and Pressure Vessel Inspectors (National Board) capacity certified pressure relief valves may apply to the National Board for a *Certificate of Authorization* to use the “VR” symbol. The National Board may at any time, through the NBIC Committee, modify the regulations concerning the issuance and use of such valve repair symbol. All such modified regulations shall become binding upon holders of valid Valve Repair *Certificates of Authorization*.
- b) Authorization to use the “VR” stamp may be granted or withheld by the National Board in its absolute discretion. If authorization is granted and proper administrative fees paid, a *Certificate of Authorization* will be issued evidencing permission to use such a symbol, expiring on the triennial anniversary date. The certificate will be signed by the National Board Chairman of the National Board of Trustees, the Executive Director, or any other duly authorized officer.
- c) The certificate shall list the physical, permanent address of record for the certificate holder’s shop/plant. For field-only scopes, this address of record shown on the *Certificate of Authorization* is where administrative, technical, and quality aspects of the business are controlled.

1.7.5.3 RENEWAL OF CERTIFICATE

The *Certificate of Authorization* is renewable every three (3) years subject to a review of the Quality System by a representative of the National Board, review and acceptance of the representative’s report by the National Board, and successful completion of capacity verification tests. See NBIC Part 3, 1.7.8 for exceptions. The applicant should apply to the National Board for renewal of authorization and re-issuance of the certificate prior to the date of expiration. The National Board reserves the absolute right to cancel, refuse to issue, or renew such authorization.

1.7.5.4 REVIEW OF APPLICANT’S FACILITY

- a) Before issuance or renewal of pressure relief “VR” *Certificates of Authorization*, the repair organization, its written quality system, and its facilities are subject to a review and verification of implementation of its quality system by a representative of the National Board. The implementation demonstration shall include, as a minimum, disassembly, inspection, repair, application of special processes, reassembly, setting, and testing of valves within the scope of the applicant’s quality system.
- b) The applicant shall repair and submit for verification testing one (1) valve for each ASME Code section (except Section III) and test fluid (steam, air/gas, liquid) which will appear on the *Certificate of Authorization*. A minimum of two (2) valves are required regardless of ASME Code sections or test fluid. The valves

shall be within the capabilities of the National Board accepted laboratory. When an applicant is using the provisions of NBIC Part 3, 4.5.2, the applicant shall submit one additional ASME Section VIII steam valve set, on air, for verification testing on steam.

- c) The applicant shall have a copy of the *National Board Pressure Relief Device Certifications* publication, NB-18, dated within one year (available from the National Board Web page), the latest Edition of the *National Board Inspection Code* (NBIC), all parts; and the ASME Code section(s) that the organization is including in its scope.
- d) It is the responsibility of the valve repair organization to make arrangements for this review. Certificates cannot be issued or renewed until the National Board is in receipt of approval of this review. Wherever possible, National Board reviews of valve repair organizations shall be coordinated with ASME reviews, when applicable.
- e) For field-only repair scopes, the review shall encompass both the applicant's address of record and field repair demonstration site. The demonstration site shall be representative of that typically encountered by the applicant (see NBIC Part 3, 1.7.5.6).

1.7.5.5 VERIFICATION TESTING

- a) Before the "VR" *Certificate of Authorization* and stamps may be issued or renewed, the demonstration valves must successfully complete capacity and operational verification tests at a National Board accepted testing laboratory. See NBIC Part 3, 1.7.5.6 and 1.7.8 for exceptions. The valves shall be typical of those repaired by the organization and within the capabilities of the testing laboratory.
- b) Tests conducted at the accepted testing laboratory shall be witnessed by a representative of the National Board. The purpose of the tests is to ensure that the repairs have been satisfactorily carried out and the function and operation of the valves meet the requirements of the section of the ASME Code to which they were manufactured.
- c) Valves not meeting the function or operational requirements of the section of the ASME Code to which they were manufactured shall be considered to have failed. Replacement valves shall be repaired and selected for testing as stated above, at a rate of two (2) valves for each one (1) that failed.
 - 1) If either or both of these replacement valves fail to meet the above criteria, the applicant shall document the cause of the noted deficiencies and actions taken to guard against future occurrence. Upon acceptance of this information by the National Board, one (1) additional valve for each replacement valve that failed shall be repaired and tested. The valve(s) shall be of the same ASME Code Section, fluid and set pressure scope, as the valve previously failing to meet the test requirement.
 - 2) Failure of this valve(s) to meet the ASME Code to which the valve was manufactured shall be cause for consideration by the National Board of revocation of the "VR" *Certificate of Authorization* or acceptance of alternative corrective action.

1.7.5.6 VERIFICATION TESTING ALTERNATIVES

- a) In such cases where all valves repaired by the applicant for a specified ASME Code Section or test fluid exceed the capabilities of the accepted testing laboratory, valves for that ASME Code Section or test fluid shall be selected as specified in NBIC Part 3, 1.7.5.4, and a demonstration test shall be successfully performed in lieu of verification testing specified in NBIC Part 3, 1.7.5.5. The demonstration tests shall be