AN INTERNATIONAL CODE

# 2007 ASME Boiler & Pressure Vessel Code

**2008a Addenda** **July 1, 2008**

# I

# RULES FOR CONSTRUCTION OF POWER BOILERS

**ASME Boiler and Pressure Vessel Committee**
**Subcommittee on Power Boilers**

The American Society of Mechanical Engineers


U010W8



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# 2007 ASME
# BOILER AND PRESSURE VESSEL CODE

**SECTIONS**

## ADDENDA

Colored-sheet Addenda, which include additions and revisions to individual Sections of the Code, are published annually and will be sent automatically to purchasers of the applicable Sections up to the publication of the 2010 Code. The 2007 Code is available only in the loose-leaf format; accordingly, the Addenda will be issued in the loose-leaf, replacement-page format.

## INTERPRETATIONS

ASME issues written replies to inquiries concerning interpretation of technical aspects of the Code. The Interpretations for each individual Section will be published separately and will be included as part of the update service to that Section. Interpretations of Section III, Divisions 1 and 2, will be included with the update service to Subsection NCA.

Interpretations of the Code are distributed annually in July with the issuance of the edition and subsequent addenda. Interpretations posted in January at www.cstools.asme.org/interpretations are included in the July distribution.

## CODE CASES

The Boiler and Pressure Vessel Committee meets regularly to consider proposed additions and revisions to the Code and to formulate Cases to clarify the intent of existing requirements or provide, when the need is urgent, rules for materials or constructions not covered by existing Code rules. Those Cases that have been adopted will appear in the appropriate 2007 Code Cases book: “Boilers and Pressure Vessels” and “Nuclear Components.” Supplements will be sent automatically to the purchasers of the Code Cases books up to the publication of the 2010 Code.

## SUMMARY OF CHANGES

Addenda to the 2007 Edition of the Code are issued in the form of replacement pages. Revisions, additions, or deletions are incorporated directly into the affected pages. It is advisable, however, that all replaced pages be retained for reference.

Replace or insert the pages listed. Changes given below are identified on the pages by a margin note, **A08**, placed next to the affected area. Revisions to the 2007 Edition are indicated by **07**. For the listing below, the *Page* references the affected area. A margin note, **A08**, placed next to the heading indicates *Location*. Revisions are listed under *Change*.

The Record Numbers listed below are explained in more detail in "List of Changes in Record Number Order" following the Summary of Changes.

| *Page* | *Location* | *Change (Record Number)* |
|---|---|---|
| xix–xxix | Roster | Updated to reflect 2008 Addenda |
| xxxi | Preamble | (1) First sentence revised *(07-1776)*<br>(2) Footnote 5 added *(07-1776)* |
| 1 | PG-2.4 | Added *(07-334)* |
| 2 | PG-5.6 | Added *(06-1082)* |
| 5 | PG-9.2 | Entries added *(03-425, 01-416)* |
| 6 | PG-9.4 | Revised *(04-1627)* |
| 10 | PG-19 | Footnote 8 revised *(07-1744)* |
| 11 | Table PG-19 | Last row added *(03-425)* |
| 13–19.3 | PG-26 | Added *(07-1670)* |
| | Table PG-26 | Added *(07-1670)* |
| | PG-27.2 | PG-27.2.1, PG-27.2.1.1, PG-27.2.1.2, PG-27.2.1.5, and PG-27.2.2 revised *(04-1670)* |
| | PG-27.3 | Nomenclature revised *(04-1627)* |
| | PG-27.4 | (1) Note (1) revised *(07-1670)*<br>(2) Note (3) revised *(07-50)*<br>(3) Note (6) revised *(03-425, 01-416)*<br>(4) Note (11) added *(04-1627)* |
| | PG-29.1 | Variable $w$ added to equation and nomenclature *(07-1670)* |
| | PG-29.11 | Variable $w$ added to equation and nomenclature *(07-1670)* |
| | PG-31.2 | Definitions of $t_f$ and $t_h$ revised *(02-2580)* |
| 22 | PG-32.1.2 | In the nomenclature, definition of $t$ revised *(02-2580)* |
| 37 | Fig. PG-52.1 | In General Note (a), "Fig. PG-53.1" corrected to "Fig. PG-52.1" by errata *(07-714)* |
| 45, 46 | PG-60.1 | Revised *(06-127)* |
| | PG-60.1.6 | Second paragraph revised *(07-1816)* |
| 47 | PG-60.3.7(e) | Added *(07-1816)* |

| *Page* | *Location* | *Change (Record Number)* |
|---|---|---|
| | Fig. PG-60.3.7 | Added *(07-1816)* |
| | Fig. PG-60.3.9 | Title revised *(07-1816)* |
| | PG-60.3.9 | Figure reference revised *(07-1816)* |
| 48 | Safety Valves and Safety Relief Valves | Footnote 20 corrected by errata *(07-306)* |
| 49 | PG-67.2.4 | Metric value corrected by errata *(08-115)* |
| | PG-67.2.6 | Metric value corrected by errata *(08-115)* |
| | PG-67.3 | Last sentence added *(07-518)* |
| 52, 52.1 | PG-68.3 | (1) Second metric value corrected by errata *(08-115)*<br>(2) Last sentence added *(06-567)* |
| 92 | Table PW-39 | (1) Third and fourth columns revised *(06-1589)*<br>(2) General Note (a)(6) corrected by errata *(07-1532)*<br>(3) General Note (a)(11)(f) redesignated to (a)(13) by errata *(07-1302)* |
| 93 | Table PW-39 | (1) Third column revised *(06-1589)*<br>(2) General Note (a)(6) corrected by errata *(07-1532)*<br>(3) General Note (a)(8)(c)(3) redesignated to (a)(9) by errata *(07-1302)* |
| 94 | Table PW-39 | (1) Third and fourth columns revised *(06-1589)*<br>(2) General Note (a)(6)(e) redesignated to (a)(7) by errata *(07-1302)*<br>(3) General Note (a)(8) added *(07-466)* |
| 95 | Table PW-39 | (1) Third and fourth columns revised *(06-1589)*<br>(2) General Note (d) added *(07-466)* |
| 96 | Table PW-39 | (1) Fourth column revised *(06-1589)*<br>(2) General Note (b) added *(07-466)*<br>(3) Last sentence added to Note (4)(d) *(07-1267)* |
| 97 | Table PW-39 | Third and fourth columns revised *(06-1589)* |
| 98 | Table PW-39 | (1) Third and fourth columns revised<br>(2) First parenthetical temperature revised in General Note (a) *(06-1589)* |
| 99 | Table PW-39 | (1) Third, fourth, and fifth columns revised<br>(2) First parenthetical temperature revised in General Note *(06-1589)* |
| 105.1–105.3 | PW-44 | Added *(04-1627)* |
| 153 | PHRSG-4(b) | Last sentence added *(07-1775)* |
| | Table PHRSG-4 | Added *(07-1775)* |
| 181 | A-125 | Nomenclature revised *(07-1670)* |
| 191 | A-317.2.1 | Last entry added to nomenclature *(07-1670)* |
| 192, 192.1 | A-317.3 | Nomenclature revised *(07-1670)* |

| *Page* | *Location* | *Change (Record Number)* |
|---|---|---|
| 232 | Table A-360 | (1) The first two publications under ASNT Specification revised *(06-12)*<br>(2) Note (1) deleted, and subsequent notes renumbered *(07-105)* |
| 233 | Form A-370 | Number 2 added under "E" Code Symbol Stamp *(07-1300)* |

**NOTE:**

Volume 58 of the Interpretations to Section I of the ASME Boiler and Pressure Vessel Code follows the last page of this Addenda.

## LIST OF CHANGES IN RECORD NUMBER ORDER

| Record Number | Change |
|---|---|
| 01-416 | Revised PG-9.2, PG-27.4, and Note (6) to incorporate UNS N06625 material for steam service. |
| 02-2580 | Revised definition of "tf" and "th" in PG-32.1.2 and definition of "t" in PG-32.1.2. |
| 03-425 | Revised PG-9.2; PG-27.4, Note (6); and Table PG-19 to incorporate Code Case 2226-2. |
| 04-1627 | Revised PG-9-4, PG-27.2.1, PG-27.2.1.1, PG-27.2.1.2, PG-27.2.1.5, and PG-27.3, and added Note (11) to PG-27.4 and PW-44 to permit inclusion of clad thickness in the calculated strength of boiler tubes. |
| 06-12 | Revised Table A-360 to indicate adoption of SNT-TC-1A-2006 and CP-189-2006. |
| 06-127 | (a) Revised the text of PG-60.1 to preclude designs incorporating cross-webbed construction and better describe the requirements for gage glass designs incorporating multiple sections, as well as the conditions that will allow ommitting overlapping of the adjacent sections.<br>(b) Inserted new footnote for PG-60.1, and renumbered the existing footnotes. |
| 06-567 | (a) Revised PG-68.1 to clarify that the location rules of PG-68.3 and mounting rules of PG-71 apply to safety relief valves for separately fired superheaters.<br>(b) Issued intent interpretation. |
| 06-1082 | Added new paragraph PG-5.6 to provide guidance on the necessary actions, if during any phase of construction or erection, a component is heated to a temperature greater than 1,470°F (800°C). |
| 06-1589 | (a) Cooling rate "60°C/hr" in Table PW-39, Note (1) for P-No. 7 and 10I revised to "55°C/hr."<br>(b) Minimum holding time "2 min/mm" in Table PW-39 for P-Nos. 1, 3, 4, 5A, 5B (Group Nos. 1 and 2) , 6, 7, and 10I revised to "1 hr/25 mm." |
| 07-50 | Deleted PG-27.4, Note (3)(d), and revised the "Value of C" table in PG-27.4, Note (3) so that it pertains to threaded sections or pipe. |
| 07-105 | Deleted Note (1) in Table A-360. |
| 07-306 | Editorially corrected PG-67, Note (19). |
| 07-334 | Added PG-2.4 to clarify service limitations as applied to thermal fluid heaters. |
| 07-466 | Incorporated Code Case 2578 by revising Tables PW-39, P-No. 4, P-No. 5A, and P-No. 5B materials to include the exemption of PWHT for attaching bare thermocouple wire by CDW and ERW. |
| 07-518 | Revised PG-67.3 to clarify the set pressure of Economizer Safety Relief Devices. |
| 07-714 | Fig. PG-52.1 corrected by errata. |
| 07-1267 | Added Note (4)(d) of Table PW-39 for P-No. 5B, Group No. 2 materials to direct the user to document the use of Note (4)(d) on the Manufacturer's Data Report. |
| 07-1300 | Revised A-370 Guide to Information Appearing on Certificate of Authorization for "E" code symbol stamp to cover design and assembly of electric boilers at the location shown on the certificate of authorization and field sites controlled by the location. |
| 07-1302 | Revised Table PW-39 for P-No.1, P-No.3, and P-No.4 to correctly format the listed conditions for exemption from PWHT requirements for stud welding of nonload-carrying studs. |
| 07-1532 | Table PW-39 corrected by errata. |
| 07-1670 | Added para. PG-26 and Table PG-26 to impose weld joint strength reduction factors on certain welds, primarily longitudinal and spiral, designed for service in the creep regime. New factor "w" was incorporated into equations in PG-27 (cylindrical components), PG-29 (heads), A-125 (thick-wall cylinder formula), and A-317 (alternative equation for cylinders under internal pressure). |
| 07-1744 | Corrected Footnote 8 reference to Appendix A-370. |
| 07-1775 | Revised PHRSG-4(b), and added Table PHRSG-4. |
| 07-1776 | Added HRSG to the list of devices in the Preamble. |
| 07-1816 | (a) In PG-60.1.6, added reference to PG-60.3.7(a) through (e) where examples on acceptable "flow through" valve construction are listed.<br>(b) In PG-60.3.7, added (e) defining the acceptable "Y Pattern" globe valve construction, including printing the figure used in B31.1 as new Fig. PG-60.3.7.<br>(c) Redesignated Fig. PG-60 as Fig. PG-60.3.9, and corrected the reference to that figure in PG-60.3.9. |
| 08-115 | Paras. PG-32, PG-67, and PG-68 corrected by errata. |

# CONTENTS

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# FOREWORD

The American Society of Mechanical Engineers set up a committee in 1911 for the purpose of formulating standard rules for the construction of steam boilers and other pressure vessels. This committee is now called the Boiler and Pressure Vessel Committee.

The Committee's function is to establish rules of safety, relating only to pressure integrity, governing the construction[1] of boilers, pressure vessels, transport tanks and nuclear components, and inservice inspection for pressure integrity of nuclear components and transport tanks, and to interpret these rules when questions arise regarding their intent. This code does not address other safety issues relating to the construction of boilers, pressure vessels, transport tanks and nuclear components, and the inservice inspection of nuclear components and transport tanks. The user of the Code should refer to other pertinent codes, standards, laws, regulations, or other relevant documents. With few exceptions, the rules do not, of practical necessity, reflect the likelihood and consequences of deterioration in service related to specific service fluids or external operating environments. Recognizing this, the Committee has approved a wide variety of construction rules in this Section to allow the user or his designee to select those which will provide a pressure vessel having a margin for deterioration in service so as to give a reasonably long, safe period of usefulness. Accordingly, it is not intended that this Section be used as a design handbook; rather, engineering judgment must be employed in the selection of those sets of Code rules suitable to any specific service or need.

This Code contains mandatory requirements, specific prohibitions, and nonmandatory guidance for construction activities. The Code does not address all aspects of these activities and those aspects which are not specifically addressed should not be considered prohibited. The Code is not a handbook and cannot replace education, experience, and the use of engineering judgment. The phrase *engineering judgment* refers to technical judgments made by knowledgeable designers experienced in the application of the Code. Engineering judgments must be consistent with Code philosophy and such judgments must never be used to overrule mandatory requirements or specific prohibitions of the Code.

[1] *Construction*, as used in this Foreword, is an all-inclusive term comprising materials, design, fabrication, examination, inspection, testing, certification, and pressure relief.

The Committee recognizes that tools and techniques used for design and analysis change as technology progresses and expects engineers to use good judgment in the application of these tools. The designer is responsible for complying with Code rules and demonstrating compliance with Code equations when such equations are mandatory. The Code neither requires nor prohibits the use of computers for the design or analysis of components constructed to the requirements of the Code. However, designers and engineers using computer programs for design or analysis are cautioned that they are responsible for all technical assumptions inherent in the programs they use and they are responsible for the application of these programs to their design.

The Code does not fully address tolerances. When dimensions, sizes, or other parameters are not specified with tolerances, the values of these parameters are considered nominal and allowable tolerances or local variances may be considered acceptable when based on engineering judgment and standard practices as determined by the designer.

The Boiler and Pressure Vessel Committee deals with the care and inspection of boilers and pressure vessels in service only to the extent of providing suggested rules of good practice as an aid to owners and their inspectors.

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

The Boiler and Pressure Vessel Committee meets regularly to consider revisions of the rules, new rules as dictated by technological development, Code Cases, and requests for interpretations. Only the Boiler and Pressure Vessel Committee has the authority to provide official interpretations of this Code. Requests for revisions, new rules, Code Cases, or interpretations shall be addressed to the Secretary in writing and shall give full particulars in order to receive consideration and action (see Mandatory Appendix covering preparation of technical inquiries). Proposed revisions to the Code resulting from inquiries will be presented to the Main Committee for appropriate action. The action of the Main Committee becomes effective only after confirmation by letter ballot of the Committee and approval by ASME.

Proposed revisions to the Code approved by the Committee are submitted to the American National Standards Institute and published at *http://cstools.asme.org/csconnect/public/index.cfm?PublicReview=Revisions* to invite comments from all interested persons. After the allotted time for public review and final approval by ASME, revisions are published annually in Addenda to the Code.

Code Cases may be used in the construction of components to be stamped with the ASME Code symbol beginning with the date of their approval by ASME.

After Code revisions are approved by ASME, they may be used beginning with the date of issuance shown on the Addenda. Revisions, except for revisions to material specifications in Section II, Parts A and B, become mandatory six months after such date of issuance, except for boilers or pressure vessels contracted for prior to the end of the six-month period. Revisions to material specifications are originated by the American Society for Testing and Materials (ASTM) and other recognized national or international organizations, and are usually adopted by ASME. However, those revisions may or may not have any effect on the suitability of material, produced to earlier editions of specifications, for use in ASME construction. ASME material specifications approved for use in each construction Code are listed in the Guidelines for Acceptable ASTM Editions in Section II, Parts A and B. These Guidelines list, for each specification, the latest edition adopted by ASME, and earlier and later editions considered by ASME to be identical for ASME construction.

The Boiler and Pressure Vessel Committee in the formulation of its rules and in the establishment of maximum design and operating pressures considers materials, construction, methods of fabrication, inspection, and safety devices.

The Code Committee does not rule on whether a component shall or shall not be constructed to the provisions of the Code. The Scope of each Section has been established to identify the components and parameters considered by the Committee in formulating the Code rules.

Questions or issues regarding compliance of a specific component with the Code rules are to be directed to the ASME Certificate Holder (Manufacturer). Inquiries concerning the interpretation of the Code are to be directed to the ASME Boiler and Pressure Vessel Committee. ASME is to be notified should questions arise concerning improper use of an ASME Code symbol.

The specifications for materials given in Section II are identical with or similar to those of specifications published by ASTM, AWS, and other recognized national or international organizations. When reference is made in an ASME material specification to a non-ASME specification for which a companion ASME specification exists, the reference shall be interpreted as applying to the ASME material specification. Not all materials included in the material specifications in Section II have been adopted for Code use. Usage is limited to those materials and grades adopted by at least one of the other Sections of the Code for application under rules of that Section. All materials allowed by these various Sections and used for construction within the scope of their rules shall be furnished in accordance with material specifications contained in Section II or referenced in the Guidelines for Acceptable ASTM Editions in Section II, Parts A and B, except where otherwise provided in Code Cases or in the applicable Section of the Code. Materials covered by these specifications are acceptable for use in items covered by the Code Sections only to the degree indicated in the applicable Section. Materials for Code use should preferably be ordered, produced, and documented on this basis; Guideline for Acceptable ASTM Editions in Section II, Part A and Guideline for Acceptable ASTM Editions in Section II, Part B list editions of ASME and year dates of specifications that meet ASME requirements and which may be used in Code construction. Material produced to an acceptable specification with requirements different from the requirements of the corresponding specifications listed in the Guideline for Acceptable ASTM Editions in Part A or Part B may also be used in accordance with the above, provided the material manufacturer or vessel manufacturer certifies with evidence acceptable to the Authorized Inspector that the corresponding requirements of specifications listed in the Guideline for Acceptable ASTM Editions in Part A or Part B have been met. Material produced to an acceptable material specification is not limited as to country of origin.

When required by context in this Section, the singular shall be interpreted as the plural, and vice-versa, and the feminine, masculine, or neuter gender shall be treated as such other gender as appropriate.

# STATEMENT OF POLICY ON THE USE OF CODE SYMBOLS AND CODE AUTHORIZATION IN ADVERTISING

ASME has established procedures to authorize qualified organizations to perform various activities in accordance with the requirements of the ASME Boiler and Pressure Vessel Code. It is the aim of the Society to provide recognition of organizations so authorized. An organization holding authorization to perform various activities in accordance with the requirements of the Code may state this capability in its advertising literature.

Organizations that are authorized to use Code Symbols for marking items or constructions that have been constructed and inspected in compliance with the ASME Boiler and Pressure Vessel Code are issued Certificates of Authorization. It is the aim of the Society to maintain the standing of the Code Symbols for the benefit of the users, the enforcement jurisdictions, and the holders of the symbols who comply with all requirements.

Based on these objectives, the following policy has been established on the usage in advertising of facsimiles of the symbols, Certificates of Authorization, and reference to Code construction. The American Society of Mechanical Engineers does not "approve," "certify," "rate," or "endorse" any item, construction, or activity and there shall be no statements or implications that might so indicate. An organization holding a Code Symbol and/or a Certificate of Authorization may state in advertising literature that items, constructions, or activities "are built (produced or performed) or activities conducted in accordance with the requirements of the ASME Boiler and Pressure Vessel Code," or "meet the requirements of the ASME Boiler and Pressure Vessel Code."

The ASME Symbol shall be used only for stamping and nameplates as specifically provided in the Code. However, facsimiles may be used for the purpose of fostering the use of such construction. Such usage may be by an association or a society, or by a holder of a Code Symbol who may also use the facsimile in advertising to show that clearly specified items will carry the symbol. General usage is permitted only when all of a manufacturer's items are constructed under the rules.

The ASME logo, which is the cloverleaf with the letters ASME within, shall not be used by any organization other than ASME.

# STATEMENT OF POLICY ON THE USE OF ASME MARKING TO IDENTIFY MANUFACTURED ITEMS

The ASME Boiler and Pressure Vessel Code provides rules for the construction of boilers, pressure vessels, and nuclear components. This includes requirements for materials, design, fabrication, examination, inspection, and stamping. Items constructed in accordance with all of the applicable rules of the Code are identified with the official Code Symbol Stamp described in the governing Section of the Code.

Markings such as "ASME," "ASME Standard," or any other marking including "ASME" or the various Code Symbols shall not be used on any item that is not constructed in accordance with all of the applicable requirements of the Code.

Items shall not be described on ASME Data Report Forms nor on similar forms referring to ASME that tend to imply that all Code requirements have been met when, in fact, they have not been. Data Report Forms covering items not fully complying with ASME requirements should not refer to ASME or they should clearly identify all exceptions to the ASME requirements.

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# PREAMBLE



This Code covers rules for construction of power boilers,[1] electric boilers,[2] miniature boilers,[3] high-temperature water boilers,[4] and heat recovery steam generators[5] to be used in stationary service and includes those power boilers used in locomotive, portable, and traction service. Reference to a paragraph includes all the subparagraphs and subdivisions under that paragraph.

The Code does not contain rules to cover all details of design and construction. Where complete details are not given, it is intended that the manufacturer, subject to the acceptance of the Authorized Inspector, shall provide details of design and construction which will be as safe as otherwise provided by the rules in the Code.

The scope of jurisdiction of Section I applies to the boiler proper and to the boiler external piping.

Superheaters, economizers, and other pressure parts connected directly to the boiler without intervening valves shall be considered as parts of the boiler proper, and their construction shall conform to Section I rules.

Boiler external piping shall be considered as that piping which begins where the boiler proper or separately fired superheater terminates at:

*(a)* the first circumferential joint for welding end connections; or

*(b)* the face of the first flange in bolted flanged connections; or

*(c)* the first threaded joint in that type of connection; and which extends up to and including the valve or valves required by this Code.

ASME Code Certification (including Data Forms and Code Symbol Stamping), and/or inspection by the Authorized Inspector, when required by this Code, is required for the boiler proper and the boiler external piping.

Construction rules for materials, design, fabrication, installation, and testing of the boiler external piping are contained in ASME B31.1, Power Piping. Piping beyond the valve or valves required by Section I is not within the scope of Section I, and it is not the intent that the Code Symbol Stamp be applied to such piping or any other piping.

The material for forced-circulation boilers, boilers with no fixed steam and water line, and high-temperature water boilers shall conform to the requirements of the Code. All other requirements shall also be met except where they relate to special features of construction made necessary in boilers of these types, and to accessories that are manifestly not needed or used in connection with such boilers, such as water gages and water columns.

Reheaters receiving steam which has passed through part of a turbine or other prime mover and separately fired steam superheaters which are not integral with the boiler are considered fired pressure vessels and their construction shall comply with Code requirements for superheaters, including safety devices. Piping between the reheater connections and the turbine or other prime mover is not within the scope of the Code.

A pressure vessel in which steam is generated by the application of heat resulting from the combustion of fuel (solid, liquid, or gaseous) shall be classed as a fired steam boiler.

Unfired pressure vessels in which steam is generated shall be classed as unfired steam boilers with the following exceptions:

*(a)* vessels known as evaporators or heat exchangers

*(b)* vessels in which steam is generated by the use of heat resulting from operation of a processing system containing a number of pressure vessels such as used in the manufacture of chemical and petroleum products

Unfired steam boilers shall be constructed under the provisions of Section I or Section VIII.

Expansion tanks connected to high-temperature water boilers without intervening valves shall be constructed to the requirements of Section I or Section VIII.

A pressure vessel in which an organic fluid is vaporized by the application of heat resulting from the combustion of fuel (solid, liquid, or gaseous) shall be constructed under the provisions of Section I. Vessels in which vapor is generated incidental to the operation of a processing system, containing a number of pressure vessels such as used in chemical and petroleum manufacture, are not covered by the rules of Section I.

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[1] Power boiler — a boiler in which steam or other vapor is generated at a pressure of more than 15 psi (100 kPa) for use external to itself.

[2] Electric boiler — a power boiler or a high-temperature water boiler in which the source of heat is electricity.

[3] Miniature boiler — a power boiler or a high-temperature water boiler in which the limits specified in PMB-2 are not exceeded.

[4] High-temperature water boiler — a water boiler intended for operation at pressures in excess of 160 psi (1.1 MPa) and/or temperatures in excess of 250°F (120°C).

[5] Heat recovery steam generator (HRSG) — a boiler that has as its principal source of thermal energy a hot gas stream having high-ramp rates and temperatures such as the exhaust of a gas turbine.