

1996 Addenda

Date of Issue: December 31, 1996

ASME BOILER AND PRESSURE VESSEL CODE An Internationally Recognized Code

SECTION VIII — DIVISION 2 Pressure Vessels — Alternative Rules

1995 Edition

Addenda to the 1995 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 these title sheets and all replaced pages be retained for reference.

SUMMARY OF CHANGES

This is the second Addenda to be published to the 1995 Edition of Section VIII, Division 2. A previous Addenda was published in 1995.

Replace or insert the pages listed. Changes given below are identified on the pages by a margin note, **A96**, placed next to the affected area. Previous Addenda changes are indicated by **A95**. The pages not listed are the reverse sides of the listed pages and contain no changes.

Page	Location	Change
iii	List of Sections	Updated to include new Division 3 under Section VIII
v	Foreword	Fourth paragraph revised
xi-xx	Personnel	Updated to reflect A96
11	Table AG-150.1	Listing for SNT-TC-1A revised
20	Part AM Contents	Updated to reflect A96
21	Part AM Contents	Updated to reflect A96
28-30	AM-204.1(b)	Revised
	AM-204.2(c)	Revised
	AM-211.3	Revised in its entirety
31	Table AM-211.2	Revised
	AM-213	Revised in its entirety
32	AM-214.1	Revised in its entirety
	AM-218.1	Revised
	AM-218.2	Revised
	AM-218.3	Second paragraph revised

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Page	Location	Change
33	Fig. AM-218.1	General Notes (a), (d), (e), and (f) revised
37	AM-310(a)	Revised in its entirety
38	AM-311.4(b)	Revised
	AM-312	Revised in its entirety
44	Table ACS-1	(1) SA-336 F11 corrected by Errata to read F11 Cl. 2 & 3 (2) SA-350 LF3 added by Errata (3) SA-537 classes added
45	Table AHA-1	(1) SA-213 TP310MoLN, SA-240 310MoLN, SA-249 TP310MoLN, and SA-312 TP310MoLN added (2) SA-336 F348, SA-403 316H, and SA-479 309S, 310H, and 310S deleted by Errata
46	Table AQT-1	(1) SA-517 D deleted by Errata (2) SA-543 C added by Errata
48	Table ABM-1	Under High Alloy Steel, Type/Grade corrected by Errata for all seven entries
49	Table ABM-1.2	General Note revised
	Table ABM-1.3	General Note revised
53	Part AD Contents	Updated to reflect A96
58	Part AD Contents	Updated to reflect A96
61	AD-121.2(d)	Revised
	AD-121.2(f)	Revised
	AD-121.2(g)	Revised
62	Table AD-120.1	For Condition (4), Temperature and Remarks revised
63	AD-130	Revised
66, 66.1	Table AD-155.1	Revised in its entirety
	AD-155	Revised in its entirety
95	AD-415	Revised in its entirety
110	AD-612	Revised
112	Fig. AD-612.1	Callouts revised in sketches (a), (b), and (c)
165	AF-200(c)	In sixth line, TP316L corrected by Errata to read F316L
177	Table AF-241.1	For Category D, first two Remarks corrected by Errata
181	AF-402	(1) In second sentence, phrase "of any welded joint in the vessel or vessel parts" deleted by Errata (2) Revised
182	Table AF-402.1	Revised in its entirety
184	Table AF-402.1	In lower half of Table, Material and Note (4) revised



Page	Location	Change
188	Table AF-402.1	In Note (2)(a), class corrected by Errata to read 1A
190	AF-402.3	First paragraph revised
200	Table AF-630.1	Under Forgings, for SA-372, Grade or Type corrected by Errata for all seven entries
205	AF-703(a)	In first line, Type VIII corrected by Errata to read Grade J, Class 110
	AF-704(a)	In first line, Type VIII corrected by Errata to read Grade J, Class 110
236, 237	AR-213	Revised in its entirety
	AR-230(d)	Revised
	AR-230(e)	Revised
239	AR-401(d)	Revised
252	AI-110(a)	Revised
	Footnote 1	Added
265	Part AT Contents	Updated to reflect A96
267	AT-111	Title added
272	AT-340	Revised
	AT-352	Revised
273	AT-422	Revised
281	AS-100(d)	Revised
282	Fig. AS-131.1	Revised
284	AS-205	(1) In second paragraph, second line corrected by Errata (2) In last paragraph, last line corrected by Errata
463, 464	G-106	For Condition (3), three cross references corrected by Errata to read 5-110.3(d), (f), and (g), respectively
465	G-107	(1) In penultimate paragraph, cross reference corrected by Errata to read 5-110.3(f) (2) In last paragraph, cross reference corrected by Errata to read 5-110.3(e) and (g) (3) In last paragraph, for Condition (3), values for N , U , and U_{total} corrected by Errata to read 8000, 0.00125, and 0.9917, respectively
467, 468	G-109	Paragraph below equation for t_{RL} corrected by Errata
474–478	G-116	(1) Equation for L_n corrected by Errata (2) All three equations regarding r_1 corrected by Errata (3) Last equations for A_5 and A_8 corrected by Errata



<i>Page</i>	<i>Location</i>	<i>Change</i>
		(4) First equation for σ corrected by Errata to read $\sigma = 2.25$
		(5) In penultimate paragraph, cross reference corrected by Errata to read 5-110.3(d) and (e)
490	Table I-220	Instruction for Note No. ① revised

NOTE:

Volume 39 of the Interpretations to Section VIII, Division 2, of the ASME Boiler and Pressure Vessel Code follows the last page of this Addenda. The Interpretations are not part of the Code or the Addenda and are included for information only.



1995 ASME BOILER AND PRESSURE VESSEL CODE

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SECTIONS

- I Rules for Construction of Power Boilers
- II Materials
 - Part A — Ferrous Material Specifications
 - Part B — Nonferrous Material Specifications
 - Part C — Specifications for Welding Rods, Electrodes, and Filler Metals
 - Part D — Properties
- III Subsection NCA — General Requirements for Division 1 and Division 2
- III Division 1
 - Subsection NB — Class 1 Components
 - Subsection NC — Class 2 Components
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 - Subsection NE — Class MC Components
 - Subsection NF — Supports
 - Subsection NG — Core Support Structures
 - Subsection NH — Class 1 Components in Elevated Temperature Service
 - Appendices
- III Division 2 — Code for Concrete Reactor Vessels and Containments
- IV Rules for Construction of Heating Boilers
- V Nondestructive Examination
- VI Recommended Rules for the Care and Operation of Heating Boilers
- VII Recommended Guidelines for the Care of Power Boilers
- VIII Rules for Construction of Pressure Vessels
 - Division 1
 - Division 2 — Alternative Rules
 - Division 3 — Alternative Rules for Construction of High Pressure Vessels*
- IX Welding and Brazing Qualifications
- X Fiber-Reinforced Plastic Pressure Vessels
- XI Rules for Inservice Inspection of Nuclear Power Plant Components

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 1998 Code. The 1995 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. They will be issued semiannually (July and December) up to the publication of the 1998 Code. Interpretations of Section III, Divisions 1 and 2, will be included with the update service to Subsection NCA. Interpretations are not part of the Code or the Addenda.

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 which have been adopted will appear in the appropriate 1995 Code Cases book: (1) Boilers and Pressure Vessels and (2) Nuclear Components. Supplements will be sent automatically to the purchasers of the Code Cases books up to the publication of the 1998 Code.

* Projected publication in 1997.

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 deemed necessary for the new construction¹ of pressure vessels that will perform in a safe and reliable manner, and to interpret these rules when questions arise regarding their intent. 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 construction¹ 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 construction¹ 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.

A95 The Committee recognizes that tools and techniques
A96 used for design and analysis change as technology

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

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 in *Mechanical Engineering* 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.

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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 6 months after such date of issuance, except for boilers or pressure vessels contracted for prior to the end of the 6 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 Appendices of Section II, Parts A and B. These Appendices list, for each specification, the latest edition adopted by ASME, and earlier and later editions considered by ASME to be identical for ASME construction.

Manufacturers and users of components are cautioned against making use of revisions and Cases that are less restrictive than former requirements without having assurance that they have been accepted by the proper authorities in the jurisdiction where the component is to be installed.

Each state and municipality in the United States and each province in Canada that adopts or accepts one or more Sections of the Boiler and Pressure Vessel Code is invited to appoint a representative to act on the Conference Committee to the Boiler and Pressure Vessel Committee. Since the members of the Conference Committee are in active contact with the administration and enforcement of the rules, the requirements for inspection in this Code correspond with those in effect in their respective jurisdictions. The required qualifications for an Authorized Inspector under these rules may be obtained from the administrative authority of any state, municipality, or province which has adopted these rules.

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. Permission may be granted to regulatory bodies and organizations publishing safety standards to use a complete Section of the Code by reference. If usage of a Section, such as Section IX, involves exceptions, omissions, or changes in provisions, the intent of the Code might not be attained.

Where a state or other regulatory body, in the printing of any Section of the Boiler and Pressure Vessel Code, makes additions or omissions, it is recommended that such changes be clearly indicated.

The National Board of Boiler and Pressure Vessel Inspectors is composed of chief inspectors of states and municipalities in the United States and of provinces in Canada that have adopted the Boiler and Pressure Vessel Code. This Board, since its organization in 1919, has functioned to uniformly administer and enforce the rules of the Boiler and Pressure Vessel Code. The cooperation of that organization with the Boiler and Pressure Vessel Committee has been extremely helpful.

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. Laws or regulations issued by municipality, state, provincial, federal, or other enforcement or regulatory bodies having jurisdiction at the location of an installation establish the mandatory applicability of the Code rules, in whole or in part, within their jurisdiction. Those laws or regulations may require the use of this Code for vessels or components not considered to be within its Scope or may establish additions or deletions in that Scope. Accordingly, inquiries regarding such laws or regulations are to be directed to the issuing enforcement or regulatory body.

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

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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 Appendices A of 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; Appendix A to Section II, Part A and Appendix A to 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 Appendix A of 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 Appendix A of 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.

Publication of the SI (Metric) Edition of the ASME Boiler and Pressure Vessel Code was discontinued with the 1986 Edition. Effective October 1, 1986, the SI Edition was withdrawn as an ASME Boiler and Pressure Vessel Code document.

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 which 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 which 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 which 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 which 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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As of July 1, 1996

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T. M. Cullen	D. W. Rahoi
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A. Selz	R. Zawierucha

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GENERAL REQUIREMENTS

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ARTICLE G-1

SCOPE AND JURISDICTION

AG-100 SCOPE¹

(a) For the scope of this Division, pressure vessels are containers for the containment of pressure, either internal or external. This pressure may be obtained from an external source or by the application of heat from a direct or indirect source, or any combination thereof. The rules of this Division, taken as a whole, provide an alternative to the minimum construction requirements for the design, fabrication, inspection, and certification of pressure vessels falling within the scope of Division 1.

(b)(1) Except as provided in (2) below, these rules cover only vessels to be installed at a fixed (stationary)² location for a specific service where operation and maintenance control is retained during the useful life of the vessel by the user who prepares or causes to be prepared the Design Specifications required by AG-301.1.

(2) These rules may also apply to pressure vessels installed in oceangoing ships, barges, and other floating craft provided prior written agreement with the local jurisdictional authority³ can be established covering operation and maintenance control for a specific service and where this operation and maintenance control is retained during the useful life of the pressure vessel by the user who prepares, or causes to be prepared, the Design Specifications required by AG-301.1. Then such a pressure vessel as described above may be constructed and stamped within the scope of this Division provided it meets all other requirements as specified with the following additional provisions.

¹ In those applications where there are laws or regulations issued by municipal, state, provincial, or federal authorities covering pressure vessels, these laws or regulations should be reviewed to determine size or service limitations of the coverage which may be different or more restrictive than those given in this paragraph.

² These rules shall not be used for fabrication of cargo tanks mounted on transport vehicles.

³ The local jurisdictional authority consists of the municipal, state, provincial, federal, or other governmental agency enforcing laws or regulations applicable to these pressure vessels.

(a) Loading conditions imposed by movement of the pressure vessel during operation and by relocation of the pressure vessel between work sites or due to loading and discharge, as applicable, shall be considered as part of AD-100 (see Table AD-150.1).

(b) The User's Design Specification shall include the agreements which resolve the problems of operation and maintenance control unique to the particular pressure vessel.

(c) Pressure vessels subject to direct firing but which are not within the scope of Section I, III, or IV may be constructed in accordance with the general rules of Division 2.

(d) Except for vessels specifically prohibited in this Division, types of vessels which may be constructed in accordance with the rules of Division 1 may also be constructed in accordance with the rules of this Division.

(e) In relation to the rules of Division 1 of Section VIII, these rules of Division 2 are more restrictive in the choice of materials which may be used but permit higher design stress intensity values to be employed in the range of temperatures over which the design stress intensity value is controlled by the ultimate strength or the yield strength; more precise design procedures are required and some common design details are prohibited; permissible fabrication procedures are specifically delineated and more complete examination testing and inspection are required.

AG-110 ADDITIONAL REQUIREMENTS FOR VERY HIGH PRESSURES

The rules of Division 2 do not specify a limitation on pressure but are not all inclusive for all types of construction. For very high pressures, some additions to or deviations from these rules may be necessary to meet the design principles and construction practices essential to vessels for such pressures. However, only in the event that, after application of additional design

principles and construction practices, the vessel still complies with all of the requirements of the Code may it be stamped with the Code symbol.

AG-120 GEOMETRIC SCOPE OF THIS DIVISION

The scope of this Division is intended to include only the vessel and integral communicating chambers⁴ and shall include the following:

(a) where external piping is to be connected to the vessel:

(1) the welding end connection for the first circumferential joint for welded connections (see AD-420.1 and AD-602);

(2) the first threaded joint for screwed connections;

(3) the face of the first flange for bolted, flanged connections;

(4) the first sealing surface for proprietary connections or fittings.

(b) where nonpressure parts are welded directly to either the internal or external surface of a pressure vessel, the weld attaching the part of the vessel. For parts beyond this weld and for stud bolted attachments, see Article D-9.

(c) pressure retaining covers for vessel openings, such as manhole and handhole covers;

(d) the first sealing surface for proprietary fittings or components for which rules are not provided by this Division, such as gages, instruments, and nonmetallic components;

(e) the scope of this Division includes provisions for pressure relief devices necessary to satisfy the requirements of Part AR and Appendix 10.

AG-121 CLASSIFICATIONS OUTSIDE THE SCOPE OF THIS DIVISION

Based on the Committee's consideration, the following classes of vessels are exempted from the scope of this Division; however, any pressure vessel within these classes not excluded from the scope of this Division by AG-100(b) but which meets all applicable requirements of this Division may be stamped with the U2 Code symbol:

(a) those within the scope of other Sections of this Code;

(b) fired process tubular heaters;

⁴ *Communicating chambers* are defined as appurtenances to the vessel which intersect the shell or heads of a vessel and form an integral part of the pressure containing enclosure, e.g., sumps.

(c) pressure containers which are integral parts or components of rotating or reciprocating mechanical devices, such as pumps, compressors, turbines, generators, engines, and hydraulic or pneumatic cylinders where the primary design considerations and/or stresses are derived from the functional requirements of the device;

(d) except as covered in AG-120(e), structures whose primary function is the transport of fluids from one location to another within a system of which it is an integral part (piping systems);

(e) piping components, such as pipe, flanges, bolting, gaskets, valves, expansion joints, fittings, and the pressure containing parts of other components, such as strainers and devices which serve such purposes as mixing, separating, snubbing, distributing, and metering or controlling flow, provided that pressure containing parts of these components are generally recognized as piping components or accessories;

(f) vessels with a nominal water containing capacity of 120 gal or less for containing water under pressure, including those containing air, the compression of which serves only as a cushion;

(g) a hot water supply storage tank heated by steam or any other indirect means when none of the following limitations is exceeded:

(1) a heat input of 200,000 Btu/hr;

(2) a water temperature of 210°F;

(3) a nominal water containing capacity of 120 gal;

(h) vessels having an internal or external operating pressure (see AD-121.3) not exceeding 15 psi with no limitation on size (see AD-300);

(i) vessels having an inside diameter, width, height, or cross section diagonal not exceeding 6 in., with no limitation on length of vessel or pressure;

(j) pressure vessels for human occupancy.⁵

The degree of nondestructive examination(s) and the acceptance standards beyond the requirements of this Division shall be a matter of prior agreement between the Manufacturer and user.

AG-121.1 Unfired Steam Boilers. Unfired steam boilers as defined in Section I shall be constructed in accordance with the rules of Section I or of Section VIII, Division 1. The following pressure vessels in which steam is generated shall be constructed in accordance with the rules of Section VIII, Division 1 or 2:

(a) vessels known as evaporators or heat exchangers;

⁵ Requirements for pressure vessels for human occupancy are covered by ASME PVHO-1.

(b) vessels which are part of a processing system, such as used in the manufacture of chemical and petroleum products.

AG-121.2 Stamping Vessels Outside the Scope of This Division. Vessels not excluded from the scope of this Division by AG-100(b) but which meet all the requirements of this Division, including the requirements for inspection and certification, may be stamped with the Code symbol.

AG-121.3 Combination Units. When a pressure vessel unit consists of more than one independent pressure chamber, only the parts of chambers which come within the scope of this Division need be constructed in compliance with its provisions (see AD-102).

AG-130 FIELD ASSEMBLY OF VESSELS

Field assembly of vessels constructed to this Division may be performed as follows.

(a) The Manufacturer of the vessel completes the vessel in the field.

(b) The manufacturer of parts of a vessel to be completed in the field by some other party stamps these parts in accordance with Code rules and supplies the A-2 Manufacturer's Partial Data Report Forms to the other party. The other party, who must hold a valid U2 Certificate of Authorization, makes the final assembly, required NDE, final pressure test; completes the A-1 Manufacturer's Data Report Form; and stamps the vessel.

(c) The field portion of the work is completed by a holder of a valid U2 Certificate of Authorization other than the vessel Manufacturer. The stamp holder performing the field work is required to supply an A-2 Manufacturer's Partial Data Report Form covering the portion of the work completed by his organization (including data on the pressure test if conducted by the stamp holder performing the field work) to the Manufacturer responsible for the Code vessel. The vessel Manufacturer applies his U2 stamp in the presence of a representative from his Inspection Agency and completes the A-1 Manufacturer's Data Report Form with his Inspector.

In all three alternatives, the party completing and signing the A-1 Manufacturer's Data Report Form assumes full Code responsibility for the vessel. In all three cases, each Manufacturer's Quality Control System shall describe the controls to assure compliance for each Code stamp holder.

AG-140 REQUIREMENTS FOR PRESSURE VESSELS FABRICATED BY LAYERED CONSTRUCTION

The rules in Section VIII, Division 1 and Division 2, to cover the construction of layered vessels have been developed to parallel each other as far as can be done within the parameters of each Division. The design criteria may influence the selection of the Division.

There are several manufacturing techniques used to fabricate layered vessels, and these rules have been developed to cover most techniques used today for which there is extensive documented construction and operational data. Some acceptable layered shell types are shown in Fig. AG-140.1. Some acceptable layered head types are shown in Fig. AG-140.2.

Additions to or deviations from the rules of this Division applicable to vessels of layered construction are given in Part AD Article D-11, Part AF Article F-8, Part AI Article I-1, and Part AS Article S-4. The Manufacturer's Quality Control System as required by AG-304 and Article I-1 shall include the construction procedure that will outline the sequence and method of application of layers and measurement of layer gaps. The following terms are used relative to layered vessels.

(a) *Layered Vessel.* A vessel having a shell and/or heads made up of two or more separate layers.

(b) *Inner Shell.* The inner cylinder which forms the pressure tight membrane.

(c) *Inner Head.* The inner head which forms the pressure tight membrane.

(d) *Shell Layer.* Layers may be cylinders formed from plate, sheet, forgings, or the equivalent formed by coiling or by helically wound interlocking strips. (This does not include wire winding.)

(e) *Head Layer.* Any one of the head layers of a layered vessel except the inner head.

(f) *Overwraps.* Layers added to the basic shell or head thickness for the purpose of building up the thickness of a layered vessel for reinforcing shell or head openings, or making a transition to thicker sections of the layered vessel.

(g) *Dummy Layer.* A layer used as a filler between the inner shell (or inner head) and other layers, and not considered as part of the required total thickness.

AG-150 STANDARDS REFERENCED BY THIS DIVISION

(a) Throughout this Division references are made to various standards, such as ANSI standards, which describe parts or fittings or which establish dimensional limits for pressure vessel parts. These standards, with

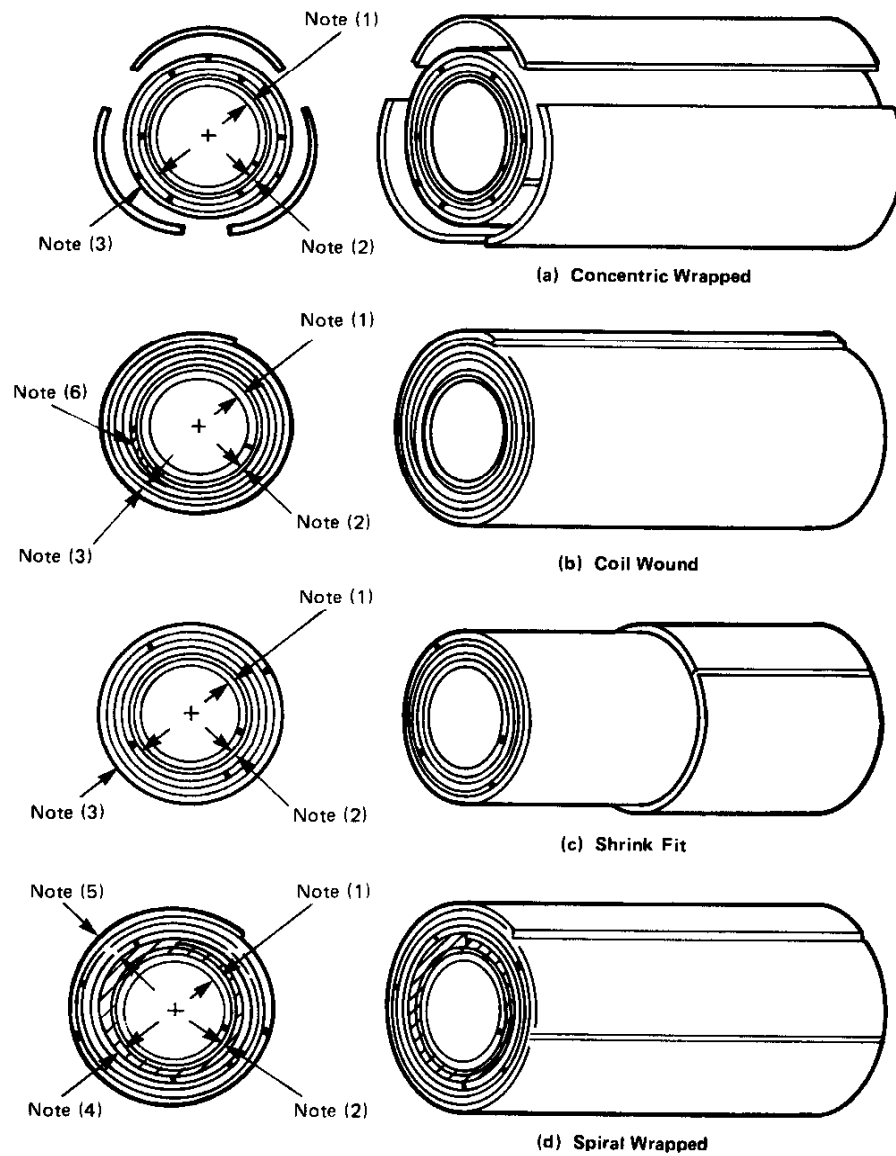
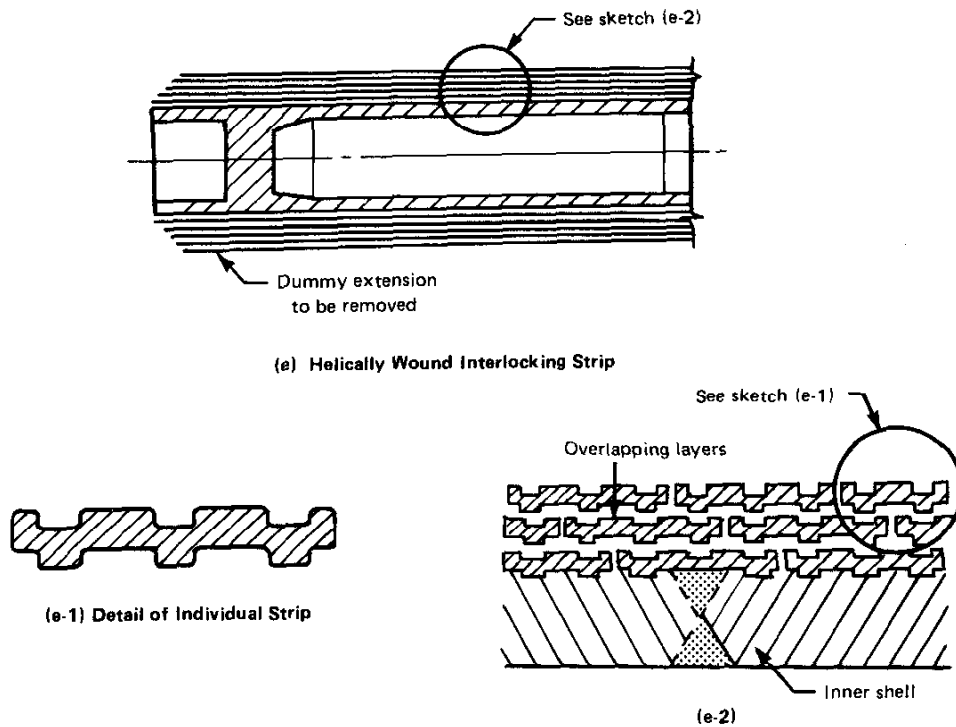


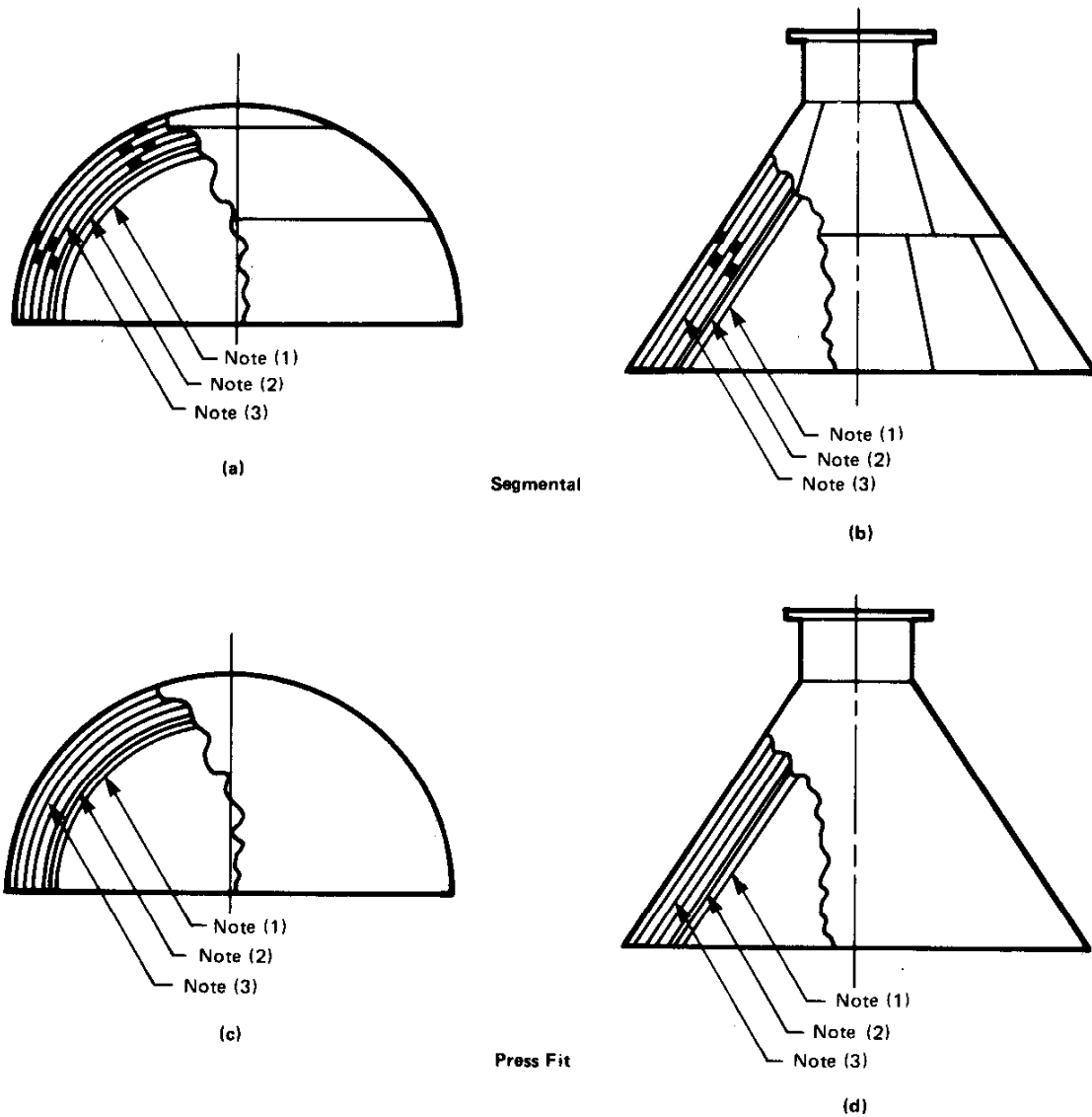
FIG. AG-140.1 SOME ACCEPTABLE LAYERED SHELL TYPES



NOTES:

- (1) Inner shell
- (2) Dummy layer (if used)
- (3) Layers
- (4) Shell layer (tapered)
- (5) Balance of layers
- (6) Gap

FIG. AG-140.1 SOME ACCEPTABLE LAYERED SHELL TYPES (CONT'D)



- NOTES:
- (1) Inner head
 - (2) Dummy layer (if used)
 - (3) Head layers

FIG. AG-140.2 SOME ACCEPTABLE LAYERED HEAD TYPES

A95
A96TABLE AG-150.1
YEAR OF ACCEPTABLE EDITION OF REFERENCED STANDARDS IN THIS DIVISION

Title	Number	Year
Unified Inch Screw Threads (UN and UNR Thread Form)	ASME B1.1	1989
Pipe Threads, General Purpose, Inch	ASME B1.20.1	1983(R1992) (1)
Pipe Flanges and Flanged Fittings	ASME/ANSI B16.5	1988
Factory Made Wrought Steel Buttwelding Fittings	ASME B16.9	1993
Forged Steel Fittings, Socket- Welding and Threaded	ASME B16.11	1991
Metallic Gaskets for Pipe Flanges — Ring-Joint, Spiral-Wound, and Jacketed	ASME B16.20	1993
Wrought Steel Buttwelding Short Radius Elbows and Returns	ASME/ANSI B16.28	1986
Large Diameter Steel Flanges (NPS 26 Through NPS 60)	ASME B16.47	1990
Square and Hex Nuts (Inch Series)	ASME/ANSI B18.2.2	1987
Welded and Seamless Wrought Steel Pipe	ANSI/ASME B36.10M	1985
Pressure Relief Devices	ASME PTC 25	1994
Seat Tightness of Pressure Relief Valves	API Standard 527	1991
Recommended Practice for Personnel Qualification and Certification in Nondestructive Testing	SNT-TC-1A	1992
Methods of Verification and Classification of Extensometers	ASTM E 83	1990
Reference Photographs for Magnetic Particle Indications on Ferrous Castings	ASTM E 125	1963(R1985) (1)
Practice for Fabricating and Checking Aluminum Alloy Ultrasonic Standard Reference Blocks	ASTM E 127	1982a(R1989) (1)
Hardness Conversion Tables for Metals	ASTM E 140	1988
Method of Conducting Drop Weight Test to Determine Nil Ductility Transition Temperature of Ferritic Steel	ASTM E 208	1987a
Reference Radiographs for High-Strength Copper-Base and Nickel-Copper Alloy Castings	ASTM E 272	1975(R1989) (1)

NOTE:

(1) R indicates reaffirmed.

the year of the acceptable edition, are listed in Table AG-150.1.

(b) Rules for the use of these standards are stated elsewhere in this Division.

AG-151 Units of Measurement

The units of measurement used in Manufacturer's Data Reports and capacity certification of pressure relief devices, and in marking or stamping of pressure vessels, pressure vessel parts, and pressure relief devices, required by this Division, shall be either:

(a) U. S. customary units (ft-lb) exclusively; or

(b) both U. S. customary units (ft-lb) and metric, in which case the U. S. customary units shall be considered the standard, and the metric units shall be shown parenthetically.