

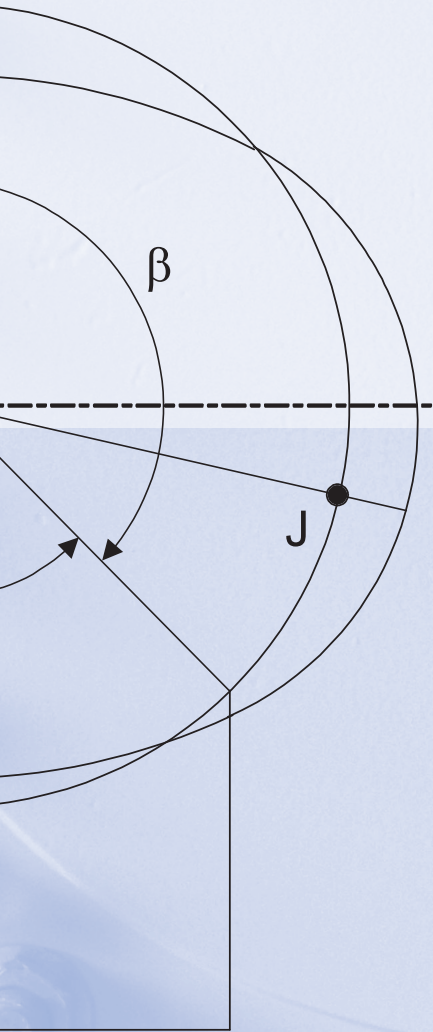
2013 ASME Boiler and Pressure Vessel Code

AN INTERNATIONAL CODE

VIII

Rules for Construction of Pressure Vessels

Division 1



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VIII RULES FOR CONSTRUCTION OF PRESSURE VESSELS

Division 1

ASME Boiler and Pressure Vessel Committee
on Pressure Vessels



The American Society of
Mechanical Engineers

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TABLE OF CONTENTS

List of Sections	xxv
Foreword	xxvii
Statement of Policy on the Use of the Certification Mark and Code Authorization in Advertising	xxix
Statement of Policy on the Use of ASME Marking to Identify Manufactured Items	xxix
Submittal of Technical Inquiries to the Boiler and Pressure Vessel Standards Committees	xxx
Personnel	xxxii
Summary of Changes	xlvi
List of Changes in Record Number Order	lvi
Cross-Referencing and Stylistic Changes in the Boiler and Pressure Vessel Code	lx
Introduction	1
Subsection A	
	General Requirements
	7
Part UG	
	General Requirements for All Methods of Construction and All Materials
	7
	Materials
	7
UG-4	General
UG-5	Plate
UG-6	Forgings
UG-7	Castings
UG-8	Pipe and Tubes
UG-9	Welding Materials
UG-10	Material Identified with or Produced to a Specification Not Permitted by this Division, and Material Not Fully Identified
UG-11	Prefabricated or Preformed Pressure Parts Furnished Without a Certification Mark
UG-12	Bolts and Studs
UG-13	Nuts and Washers
UG-14	Rods and Bars
UG-15	Product Specification
UG-16	Design
UG-17	General
UG-18	Methods of Fabrication in Combination
UG-19	Materials in Combination
UG-20	Special Constructions
UG-21	Design Temperature
UG-22	Design Pressure
UG-23	Loadings
UG-24	Maximum Allowable Stress Values
UG-25	Castings
UG-26	Corrosion
UG-27	Linings
UG-28	Thickness of Shells Under Internal Pressure
UG-29	Thickness of Shells and Tubes Under External Pressure
UG-30	Stiffening Rings for Cylindrical Shells Under External Pressure
UG-31	Attachment of Stiffening Rings
UG-32	Tubes, and Pipe When Used as Tubes or Shells
UG-33	Formed Heads, and Sections, Pressure on Concave Side
UG-34	Formed Heads, Pressure on Convex Side
	Unstayed Flat Heads and Covers
	32

UG-35	Other Types of Closures	36
	Openings and Reinforcements	37
UG-36	Openings in Pressure Vessels	37
UG-37	Reinforcement Required for Openings in Shells and Formed Heads ..	39
UG-38	Flued Openings in Shells and Formed Heads	43
UG-39	Reinforcement Required for Openings in Flat Heads	43
UG-40	Limits of Reinforcement	45
UG-41	Strength of Reinforcement	48
UG-42	Reinforcement of Multiple Openings	48
UG-43	Methods of Attachment of Pipe and Nozzle Necks to Vessel Walls ...	50
UG-44	Flanges and Pipe Fittings	52
UG-45	Nozzle Neck Thickness	52
UG-46	Inspection Openings	53
	Braced and Stayed Surfaces	54
UG-47	Braced and Stayed Surfaces	54
UG-48	Staybolts	55
UG-49	Location of Staybolts	55
UG-50	Dimensions of Staybolts	55
	Ligaments	56
UG-53	Ligaments	56
UG-54	Supports	58
UG-55	Lugs for Platforms, Ladders, and Other Attachments to Vessel Walls .	58
	Fabrication	58
UG-75	General	58
UG-76	Cutting Plates and Other Stock	58
UG-77	Material Identification (see UG-85)	58
UG-78	Repair of Defects in Materials	61
UG-79	Forming Pressure Parts	61
UG-80	Permissible Out-of-Roundness of Cylindrical, Conical, and Spherical Shells	61
UG-81	Tolerance for Formed Heads	63
UG-82	Lugs and Fitting Attachments	63
UG-83	Holes for Screw Stays	64
UG-84	Charpy Impact Tests	64
UG-85	Heat Treatment	70
	Inspection and Tests	70
UG-90	General	70
UG-91	The Inspector	71
UG-92	Access for Inspector	71
UG-93	Inspection of Materials	72
UG-94	Marking on Materials	73
UG-95	Examination of Surfaces During Fabrication	73
UG-96	Dimensional Check of Component Parts	73
UG-97	Inspection During Fabrication	73
UG-98	Maximum Allowable Working Pressure	73
UG-99	Standard Hydrostatic Test	73
UG-100	Pneumatic Test (see UW-50)	75
UG-101	Proof Tests to Establish Maximum Allowable Working Pressure	76
UG-102	Test Gages	81
UG-103	Nondestructive Testing	81
	Marking and Reports	81
UG-115	General	81
UG-116	Required Marking	81
UG-117	Certificates of Authorization and Certification Marks	83
UG-118	Methods of Marking	85
UG-119	Nameplates	85

UG-120	Data Reports	86
	Overpressure Protection	88
UG-125	General	88
UG-126	Pressure Relief Valves	89
UG-127	Nonreclosing Pressure Relief Devices	89
UG-128	Liquid Pressure Relief Valves	91
UG-129	Marking	91
UG-130	Certification Mark	94
UG-131	Certification of Capacity of Pressure Relief Devices	94
UG-132	Certification of Capacity of Pressure Relief Valves in Combination with Nonreclosing Pressure Relief Devices	98
UG-133	Determination of Pressure Relieving Requirements	99
UG-134	Pressure Settings and Performance Requirements	99
UG-135	Installation	100
UG-136	Minimum Requirements for Pressure Relief Valves	100
UG-137	Minimum Requirements for Rupture Disk Devices	104
UG-138	Minimum Requirements for Pin Devices	105
UG-140	Overpressure Protection by System Design	107
Subsection B	Requirements Pertaining to Methods of Fabrication of Pressure Vessels	109
Part UW	Requirements for Pressure Vessels Fabricated by Welding	109
	General	109
UW-1	Scope	109
UW-2	Service Restrictions	109
UW-3	Welded Joint Category	110
	Materials	111
UW-5	General	111
UW-6	Nonmandatory Guidelines for Welding Material Selections	112
	Design	112
UW-8	General	112
UW-9	Design of Welded Joints	112
UW-10	Postweld Heat Treatment	113
UW-11	Radiographic and Ultrasonic Examination	113
UW-12	Joint Efficiencies	114
UW-13	Attachment Details	114
UW-14	Openings in or Adjacent to Welds	123
UW-15	Welded Connections	124
UW-16	Minimum Requirements for Attachment Welds at Openings	124
UW-17	Plug Welds	134
UW-18	Fillet Welds	135
UW-19	Welded Stayed Construction	135
UW-20	Tube-to-Tubesheet Welds	135
UW-21	ASME B16.5 Socket and Slip-on Flange Welds	139
	Fabrication	139
UW-26	General	139
UW-27	Welding Processes	140
UW-28	Qualification of Welding Procedure	140
UW-29	Tests of Welders and Welding Operators	140
UW-30	Lowest Permissible Temperatures for Welding	141
UW-31	Cutting, Fitting, and Alignment	141
UW-32	Cleaning of Surfaces to be Welded	141
UW-33	Alignment Tolerance	141
UW-34	Spin-Holes	141
UW-35	Finished Longitudinal and Circumferential Joints	142
UW-36	Fillet Welds	142

UW-37	Miscellaneous Welding Requirements	142
UW-38	Repair of Weld Defects	143
UW-39	Peening	143
UW-40	Procedures for Postweld Heat Treatment	143
UW-41	Sectioning of Welded Joints	145
UW-42	Surface Weld Metal Buildup	145
	Inspection and Tests	145
UW-46	General	145
UW-47	Check of Welding Procedure	146
UW-48	Check of Welder and Welding Operator Qualifications	146
UW-49	Check of Postweld Heat Treatment Practice	146
UW-50	Nondestructive Examination of Welds on Pneumatically Tested Vessels	146
UW-51	Radiographic Examination of Welded Joints	146
UW-52	Spot Examination of Welded Joints	146
UW-53	Technique for Ultrasonic Examination of Welded Joints	147
UW-54	Qualification of Nondestructive Examination Personnel	148
	Marking and Reports	148
UW-60	General	148
	Pressure Relief Devices	148
UW-65	General	148
Part UF	Requirements for Pressure Vessels Fabricated by Forging	149
	General	149
UF-1	Scope	149
	Materials	149
UF-5	General	149
UF-6	Forgings	149
UF-7	Forged Steel Rolls Used for Corrugating Paper Machinery	149
	Design	149
UF-12	General	149
UF-13	Head Design	150
UF-25	Corrosion Allowance	150
	Fabrication	150
UF-26	General	150
UF-27	Tolerances on Body Forgings	150
UF-28	Methods of Forming Forged Heads	150
UF-29	Tolerance on Forged Heads	150
UF-30	Localized Thin Areas	150
UF-31	Heat Treatment	150
UF-32	Welding for Fabrication	151
UF-37	Repair of Defects in Material	152
UF-38	Repair of Weld Defects	152
UF-43	Attachment of Threaded Nozzles to Integrally Forged Necks and Thickened Heads on Vessels	153
	Inspection and Tests	153
UF-45	General	153
UF-46	Acceptance by Inspector	153
UF-47	Parts Forging	153
UF-52	Check of Heat Treatment and Postweld Heat Treatment	153
UF-53	Test Specimens	153
UF-54	Tests and Retests	153
UF-55	Ultrasonic Examination	153
	Marking and Reports	154
UF-115	General	154
	Pressure Relief Devices	154
UF-125	General	154

Part UB	Requirements for Pressure Vessels Fabricated by Brazing	155
	General	155
UB-1	Scope	155
UB-2	Elevated Temperature	155
UB-3	Service Restrictions	155
	Materials	155
UB-5	General	155
UB-6	Brazing Filler Metals	155
UB-7	Fluxes and Atmospheres	156
	Design	156
UB-9	General	156
UB-10	Strength of Brazed Joints	156
UB-11	Qualification of Brazed Joints for Design Temperatures Up to the Maximum Shown in Column 1 of Table UB-2	156
UB-12	Qualification of Brazed Joints for Design Temperatures in the Range Shown in Column 2 of Table UB-2	156
UB-13	Corrosion	156
UB-14	Joint Efficiency Factors	156
UB-15	Application of Brazing Filler Metal	156
UB-16	Permissible Types of Joints	157
UB-17	Joint Clearance	157
UB-18	Joint Brazing Procedure	157
UB-19	Openings	158
UB-20	Nozzles	158
UB-21	Brazed Connections	158
UB-22	Low Temperature Operation	158
	Fabrication	159
UB-30	General	159
UB-31	Qualification of Brazing Procedure	159
UB-32	Qualification of Brazers and Brazing Operators	159
UB-33	Buttstraps	160
UB-34	Cleaning of Surfaces to be Brazed	160
UB-35	Clearance between Surfaces to be Brazed	160
UB-36	Postbrazing Operations	160
UB-37	Repair of Defective Brazing	160
	Inspection and Tests	160
UB-40	General	160
UB-41	Inspection During Fabrication	160
UB-42	Procedure	160
UB-43	Brazer and Brazing Operator	160
UB-44	Visual Examination	160
UB-50	Exemptions	161
	Marking and Reports	161
UB-55	General	161
	Pressure Relief Devices	161
UB-60	General	161
Subsection C	Requirements Pertaining to Classes of Materials	162
Part UCS	Requirements for Pressure Vessels Constructed of Carbon and Low Alloy Steels	162
	General	162
UCS-1	Scope	162
	Materials	162
UCS-5	General	162
UCS-6	Steel Plates	162
UCS-7	Steel Forgings	163

UCS-8	Steel Castings	163
UCS-9	Steel Pipe and Tubes	163
UCS-10	Bolt Materials	163
UCS-11	Nuts and Washers	163
UCS-12	Bars and Shapes	163
	Design	163
UCS-16	General	163
UCS-19	Welded Joints	163
UCS-23	Maximum Allowable Stress Values	164
UCS-27	Shells Made From Pipe	164
UCS-28	Thickness of Shells Under External Pressure	164
UCS-29	Stiffening Rings for Shells Under External Pressure	165
UCS-30	Attachment of Stiffening Rings to Shell	165
UCS-33	Formed Heads, Pressure on Convex Side	165
UCS-56	Requirements for Postweld Heat Treatment	165
UCS-57	Radiographic Examination	176
	Low Temperature Operation	176
UCS-65	Scope	176
UCS-66	Materials	176
UCS-67	Impact Tests of Welding Procedures	188
UCS-68	Design	191
	Fabrication	192
UCS-75	General	192
UCS-79	Forming Pressure Parts	192
UCS-85	Heat Treatment of Test Specimens	193
	Inspection and Tests	194
UCS-90	General	194
	Marking and Reports	194
UCS-115	General	194
	Pressure Relief Devices	194
UCS-125	General	194
	Nonmandatory Appendix CS	194
UCS-150	General	194
UCS-151	Creep-Rupture Properties of Carbon Steels	194
UCS-160	Vessels Operating at Temperatures Colder than the MDMT Stamped on the Nameplate	194
Part UNF	Requirements for Pressure Vessels Constructed of Nonferrous Materials	195
	General	195
UNF-1	Scope	195
UNF-3	Uses	195
UNF-4	Conditions of Service	195
	Materials	195
UNF-5	General	195
UNF-6	Nonferrous Plate	195
UNF-7	Forgings	195
UNF-8	Castings	195
UNF-12	Bolt Materials	195
UNF-13	Nuts and Washers	196
UNF-14	Rods, Bars, and Shapes	196
UNF-15	Other Materials	196
	Design	196
UNF-16	General	196
UNF-19	Welded Joints	196
UNF-23	Maximum Allowable Stress Values	196
UNF-28	Thickness of Shells Under External Pressure	199

UNF-30	Stiffening Rings	199
UNF-33	Formed Heads, Pressure on Convex Side	199
UNF-56	Postweld Heat Treatment	199
UNF-57	Radiographic Examination	200
UNF-58	Liquid Penetrant Examination	200
UNF-65	Low Temperature Operation	200
	Fabrication	200
UNF-75	General	200
UNF-77	Forming Shell Sections and Heads	201
UNF-78	Welding	201
UNF-79	Requirements for Postfabrication Heat Treatment Due to Straining ..	201
	Inspection and Tests	201
UNF-90	General	201
UNF-91	Requirements for Penetrameter	201
UNF-95	Welding Test Plates	201
	Marking and Reports	201
UNF-115	General	201
	Pressure Relief Devices	202
UNF-125	General Vessels	202
Nonmandatory Appendix NF	Characteristics of the Nonferrous Materials (Informative and Nonmandatory)	203
Part UHA	Requirements for Pressure Vessels Constructed of High Alloy Steel	205
	General	205
UHA-1	Scope	205
UHA-5	Uses	205
UHA-6	Conditions of Service	205
UHA-8	Material	205
	Materials	205
UHA-11	General	205
UHA-12	Bolt Materials	205
UHA-13	Nuts and Washers	205
	Design	205
UHA-20	General	205
UHA-21	Welded Joints	206
UHA-23	Maximum Allowable Stress Values	206
UHA-28	Thickness of Shells Under External Pressure	206
UHA-29	Stiffening Rings for Shells Under External Pressure	206
UHA-30	Attachment of Stiffening Rings to Shell	206
UHA-31	Formed Heads, Pressure on Convex Side	206
UHA-32	Requirements for Postweld Heat Treatment	206
UHA-33	Radiographic Examination	212
UHA-34	Liquid Penetrant Examination	212
	Fabrication	212
UHA-40	General	212
UHA-42	Weld Metal Composition	212
UHA-44	Requirements for Postfabrication Heat Treatment Due to Straining ..	212
	Inspection and Tests	214
UHA-50	General	214
UHA-51	Impact Tests	214
UHA-52	Welded Test Plates	217
	Marking and Reports	217
UHA-60	General	217
	Pressure Relief Devices	217
UHA-65	General	217

Nonmandatory Appendix HA	Suggestions on the Selection and Treatment of Austenitic Chromium–Nickel and Ferritic and Martensitic High Chromium Steels (Informative and Nonmandatory)	218
Part UCI	Requirements for Pressure Vessels Constructed of Cast Iron	219
	General	219
UCI-1	Scope	219
UCI-2	Service Restrictions	219
UCI-3	Pressure–Temperature Limitations	219
	Materials	219
UCI-5	General	219
UCI-12	Bolt Materials	219
	Design	219
UCI-16	General	219
UCI-23	Maximum Allowable Stress Values	219
UCI-28	Thickness of Shells Under External Pressure	220
UCI-29	Dual Metal Cylinders	220
UCI-32	Heads with Pressure on Concave Side	220
UCI-33	Heads with Pressure on Convex Side	220
UCI-35	Spherically Shaped Covers (Heads)	220
UCI-36	Openings and Reinforcements	220
UCI-37	Corners and Fillets	221
	Fabrication	221
UCI-75	General	221
UCI-78	Repairs in Cast Iron Materials	221
	Inspection and Tests	222
UCI-90	General	222
UCI-99	Standard Hydrostatic Test	222
UCI-101	Hydrostatic Test to Destruction	222
	Marking and Reports	222
UCI-115	General	222
	Pressure Relief Devices	222
UCI-125	General	222
Part UCL	Requirements for Welded Pressure Vessels Constructed of Material with Corrosion Resistant Integral Cladding, Weld Metal Overlay Cladding, or with Applied Linings	223
	General	223
UCL-1	Scope	223
UCL-2	Methods of Fabrication	223
UCL-3	Conditions of Service	223
	Materials	223
UCL-10	General	223
UCL-11	Integral and Weld Metal Overlay Clad Material	223
UCL-12	Lining	224
	Design	224
UCL-20	General	224
UCL-23	Maximum Allowable Stress Values	224
UCL-24	Maximum Allowable Working Temperature	225
UCL-25	Corrosion of Cladding or Lining Material	225
UCL-26	Thickness of Shells and Heads Under External Pressure	225
UCL-27	Low Temperature Operations	225
	Fabrication	225
UCL-30	General	225
UCL-31	Joints in Integral or Weld Metal Overlay Cladding and Applied Linings	225
UCL-32	Weld Metal Composition	225
UCL-33	Inserted Strips in Clad Material	225

UCL-34	Postweld Heat Treatment	225
UCL-35	Radiographic Examination	226
UCL-36	Examination of Chromium Stainless Steel Cladding or Lining	226
UCL-40	Welding Procedures	226
UCL-42	Alloy Welds in Base Metal	226
UCL-46	Fillet Welds	226
	Inspection and Tests	226
UCL-50	General	226
UCL-51	Tightness of Applied Lining	227
UCL-52	Hydrostatic Test	227
	Marking and Reports	227
UCL-55	General	227
	Pressure Relief Devices	227
UCL-60	General	227
Part UCD	Requirements for Pressure Vessels Constructed of Cast Ductile	
	Iron	228
	General	228
UCD-1	Scope	228
UCD-2	Service Restrictions	228
UCD-3	Pressure-Temperature Limitations	228
	Materials	228
UCD-5	General	228
UCD-12	Bolt Materials	228
	Design	228
UCD-16	General	228
UCD-23	Maximum Allowable Stress Values	228
UCD-28	Thickness of Shells Under External Pressure	228
UCD-32	Heads with Pressure on Concave Side	228
UCD-33	Heads with Pressure on Convex Side	229
UCD-35	Spherically Shaped Covers (Heads)	229
UCD-36	Openings and Reinforcements	229
UCD-37	Corners and Fillets	229
	Fabrication	229
UCD-75	General	229
UCD-78	Repairs in Cast Ductile Iron Material	229
	Inspection and Tests	230
UCD-90	General	230
UCD-99	Standard Hydrostatic Test	230
UCD-101	Hydrostatic Test to Destruction	231
	Marking and Reports	231
UCD-115	General	231
	Pressure Relief Devices	231
UCD-125	General	231
Part UHT	Requirements for Pressure Vessels Constructed of Ferritic Steels	
	with Tensile Properties Enhanced by Heat Treatment	232
	General	232
UHT-1	Scope	232
	Materials	232
UHT-5	General	232
UHT-6	Test Requirements	232
	Design	233
UHT-16	General	233
UHT-17	Welded Joints	233
UHT-18	Nozzles	234
UHT-19	Conical Sections	234

UHT-20	Joint Alignment	234
UHT-23	Maximum Allowable Stress Values	234
UHT-25	Corrosion Allowance	234
UHT-27	Thickness of Shells Under External Pressure	237
UHT-28	Structural Attachments and Stiffening Rings	237
UHT-29	Stiffening Rings for Shells Under External Pressure	237
UHT-30	Attachment of Stiffening Rings to Shells	237
UHT-32	Formed Heads, Pressure on Concave Side	237
UHT-33	Formed Heads, Pressure on Convex Side	237
UHT-34	Hemispherical Heads	237
UHT-40	Materials Having Different Coefficients of Expansion	237
UHT-56	Postweld Heat Treatment	237
UHT-57	Examination	238
	Fabrication	239
UHT-75	General	239
UHT-79	Forming Pressure Parts	239
UHT-80	Heat Treatment	239
UHT-81	Heat Treatment Verification Tests	239
UHT-82	Welding	240
UHT-83	Methods of Metal Removal	241
UHT-84	Weld Finish	241
UHT-85	Structural and Temporary Welds	241
UHT-86	Marking on Plates and Other Materials	242
	Inspection and Tests	242
UHT-90	General	242
	Marking and Reports	242
UHT-115	General	242
	Pressure Relief Devices	242
UHT-125	General	242
Part ULW	Requirements for Pressure Vessels Fabricated by Layered Construction	243
	Introduction	243
ULW-1	Scope	243
ULW-2	Nomenclature	243
	Material	243
ULW-5	General	243
	Design	243
ULW-16	General	243
ULW-17	Design of Welded Joints	246
ULW-18	Nozzle Attachments and Opening Reinforcement	246
ULW-20	Welded Joint Efficiency	254
ULW-22	Attachments	254
ULW-26	Postweld Heat Treatment	254
	Welding	258
ULW-31	Welded Joints	258
ULW-32	Welding Procedure Qualification	258
ULW-33	Performance Qualification	258
	Nondestructive Examination of Welded Joints	258
ULW-50	General	258
ULW-51	Inner Shells and Inner Heads	258
ULW-52	Layers — Welded Joints	258
ULW-53	Layers — Step Welded Girth Joints	260
ULW-54	Butt Joints	260
ULW-55	Flat Head and Tubesheet Weld Joints	261
ULW-56	Nozzle and Communicating Chambers Weld Joints	261
ULW-57	Random Spot Examination and Repairs of Weld	261

	Fabrication	262
ULW-75	General	262
ULW-76	Vent Holes	262
ULW-77	Contact Between Layers	264
ULW-78	Alternative to Measuring Contact Between Layers During Construction	264
	Inspection and Testing	265
ULW-90	General	265
	Marking and Reports	265
ULW-115	General	265
	Pressure Relief Devices	265
ULW-125	General	265
Part ULT	Alternative Rules for Pressure Vessels Constructed of Materials	
	Having Higher Allowable Stresses at Low Temperature	266
	General	266
ULT-1	Scope	266
ULT-2	Conditions of Service	266
ULT-5	General	266
	Design	267
ULT-16	General	267
ULT-17	Welded Joints	267
ULT-18	Nozzles and Other Connections	267
ULT-23	Maximum Allowable Stress Values	267
ULT-27	Thickness of Shells	267
ULT-28	Thickness of Shells Under External Pressure	267
ULT-29	Stiffening Rings for Shells Under External Pressure	267
ULT-30	Structural Attachments	267
ULT-56	Postweld Heat Treatment	267
ULT-57	Examination	270
	Fabrication	270
ULT-75	General	270
ULT-79	Forming Shell Sections and Heads	270
ULT-82	Welding	270
ULT-86	Marking on Plate and Other Materials	270
	Inspection and Tests	270
ULT-90	General	270
ULT-99	Hydrostatic Test	270
ULT-100	Pneumatic Test	273
	Marking and Reports	273
ULT-115	General	273
	Pressure Relief Devices	273
ULT-125	General	273
Part UHX	Rules for Shell-and-Tube Heat Exchangers	274
Part UIG	Requirements for Pressure Vessels Constructed of Impregnated	
	Graphite	319
	Nonmandatory Introduction	319
	General	319
UIG-1	Scope	319
UIG-2	Equipment and Service Limitations	319
UIG-3	Terminology	320
	Materials	320
UIG-5	Raw Material Control	320
UIG-6	Certified Material Control	320
UIG-7	Additional Properties	320
UIG-8	Tolerances for Impregnated Graphite Tubes	321
	Design	321

UIG-22	Loadings	321
UIG-23	Maximum Allowable Stress Values for Certified Material	321
UIG-27	Thickness of Cylindrical Shells Made of Certified Materials under Internal Pressure	321
UIG-28	External Pressure	321
UIG-29	Euler Buckling of Extruded Graphite Tubes	322
UIG-34	Calculating Flat Heads, Covers, and Tubesheets	322
UIG-36	Openings and Reinforcements	323
UIG-45	Nozzle Neck Thickness	330
UIG-60	Lethal Service	330
	Fabrication	330
UIG-75	General Requirements	330
UIG-76	Procedure and Personnel Qualification	330
UIG-77	Certified Material Specification	330
UIG-78	Certified Cement Specification	331
UIG-79	Certified Cementing Procedure Specification	332
UIG-80	Cementing Technician Qualification	332
UIG-81	Repair of Materials	335
UIG-84	Required Tests	335
	Inspection and Tests	337
UIG-90	General	337
UIG-95	Visual Examination	337
UIG-96	Qualification of Visual Examination Personnel	337
UIG-97	Acceptance Standards and Documentation	337
UIG-99	Pressure Tests	337
UIG-112	Quality Control Requirements	337
UIG-115	Markings and Reports	337
UIG-116	Required Markings	337
UIG-120	Data Reports	338
UIG-121	Records	338
UIG-125	Pressure Relief Devices	338
Mandatory Appendix 1	Supplementary Design Formulas	351
Mandatory Appendix 2	Rules for Bolted Flange Connections with Ring Type Gaskets	373
Mandatory Appendix 3	Definitions	396
Mandatory Appendix 4	Rounded Indications Charts Acceptance Standard for Radiographically Determined Rounded Indications in Welds ..	399
Mandatory Appendix 5	Flanged-and-Flued or Flanged-Only Expansion Joints	408
Mandatory Appendix 6	Methods for Magnetic Particle Examination (MT)	411
Mandatory Appendix 7	Examination of Steel Castings	413
Mandatory Appendix 8	Methods for Liquid Penetrant Examination (PT)	416
Mandatory Appendix 9	Jacketed Vessels	418
Mandatory Appendix 10	Quality Control System	427
Mandatory Appendix 11	Capacity Conversions for Safety Valves	430
Mandatory Appendix 12	Ultrasonic Examination of Welds (UT)	434
Mandatory Appendix 13	Vessels of Noncircular Cross Section	435
Mandatory Appendix 14	Integral Flat Heads with a Large, Single, Circular, Centrally Located Opening	465
Mandatory Appendix 16	.....	469

Mandatory Appendix 17	Dimpled or Embossed Assemblies	470
Mandatory Appendix 18	Adhesive Attachment of Nameplates	482
Mandatory Appendix 19	Electrically Heated or Gas-Fired Jacketed Steam Kettles	483
Mandatory Appendix 20	Hubs Machined from Plate	484
Mandatory Appendix 21	Jacketed Vessels Constructed of Work-Hardened Nickel	485
Mandatory Appendix 22	Integrally Forged Vessels	486
Mandatory Appendix 23	External Pressure Design of Copper, Copper Alloy, and Titanium Alloy Condenser and Heat Exchanger Tubes with Integral Fins	488
Mandatory Appendix 24	Design Rules for Clamp Connections	490
Mandatory Appendix 25	Acceptance of Testing Laboratories and Authorized Observers for Capacity Certification of Pressure Relief Valves	496
Mandatory Appendix 26	Bellows Expansion Joints	498
Mandatory Appendix 27	Alternative Requirements for Glass-Lined Vessels	523
Mandatory Appendix 28	Alternative Corner Weld Joint Detail for Box Headers for Air-Cooled Heat Exchangers	525
Mandatory Appendix 30	Rules for Drilled Holes not Penetrating Through Vessel Wall	528
Mandatory Appendix 31	Rules for Cr-Mo Steels with Additional Requirements for Welding and Heat Treatment	530
Mandatory Appendix 32	Local Thin Areas in Cylindrical Shells and in Spherical Segments of Shells	533
Mandatory Appendix 33	Standard Units for Use in Equations	537
Mandatory Appendix 34	Requirements for Use of High Silicon Stainless Steels for Pressure Vessels	538
Mandatory Appendix 35	Rules for Mass Production of Pressure Vessels	540
Mandatory Appendix 36	Standard Test Method for Determining the Flexural Strength of Certified Materials Using Three-Point Loading	543
Mandatory Appendix 37	Standard Test Method for Determining the Tensile Strength of Certified Impregnated Graphite Materials	545
Mandatory Appendix 38	Standard Test Method for Compressive Strength of Impregnated Graphite	547
Mandatory Appendix 39	Testing the Coefficient of Permeability of Impregnated Graphite	549
Mandatory Appendix 40	Thermal Expansion Test Method for Graphite and Impregnated Graphite	551
Mandatory Appendix 41	Electric Immersion Heater Element Support Plates	554
Mandatory Appendix 42	Diffusion Bonding	559
Mandatory Appendix 43	Establishing Governing Code Editions and Cases for Pressure Vessels and Parts	561
Mandatory Appendix 44	Cold Stretching of Austenitic Stainless Steel Pressure Vessels	562
Nonmandatory Appendix A	Basis for Establishing Allowable Loads for Tube-to-Tubesheet Joints	565
Nonmandatory Appendix C	Suggested Methods for Obtaining the Operating Temperature of Vessel Walls in Service	571

Nonmandatory Appendix D	Suggested Good Practice Regarding Internal Structures	572
Nonmandatory Appendix E	Suggested Good Practice Regarding Corrosion Allowance	573
Nonmandatory Appendix F	Suggested Good Practice Regarding Linings	574
Nonmandatory Appendix G	Suggested Good Practice Regarding Piping Reactions and Design of Supports and Attachments	575
Nonmandatory Appendix H	Guidance to Accommodate Loadings Produced by Deflagration ..	577
Nonmandatory Appendix K	Sectioning of Welded Joints	579
Nonmandatory Appendix L	Application of Rules for Joint Efficiency in Shells and Heads of Vessels With Welded Joints	581
Nonmandatory Appendix M	Installation and Operation	588
Nonmandatory Appendix P	Basis for Establishing Allowable Stress Values for UCI, UCD, and ULT Materials	594
Nonmandatory Appendix R	Preheating	596
Nonmandatory Appendix S	Design Considerations for Bolted Flange Connections	598
Nonmandatory Appendix T	Temperature Protection	600
Nonmandatory Appendix W	Guide for Preparing Manufacturer's Data Reports	601
Nonmandatory Appendix Y	Flat Face Flanges with Metal-to-Metal Contact Outside the Bolt Circle	630
Nonmandatory Appendix DD	Guide to Information Appearing on Certificate of Authorization ..	644
Nonmandatory Appendix EE	Half-Pipe Jackets	647
Nonmandatory Appendix FF	Guide for the Design and Operation of Quick-Actuating (Quick-Opening) Closures	652
Nonmandatory Appendix GG	Guidance for the use of U.S. Customary and Si Units in the Asme Boiler and Pressure Vessel Code	654
Nonmandatory Appendix HH	Tube Expanding Procedures and Qualification	657
Nonmandatory Appendix JJ	Flowcharts Illustrating Toughness Testing Requirements and Exemptions from Toughness Testing by the Rules of UHA-51 ..	667
Nonmandatory Appendix KK	Guide for Preparing User's Design Requirements	673
Nonmandatory Appendix LL	Graphical Representations of $F_{t,min}$ and $F_{t,max}$	679
Nonmandatory Appendix MM	Alternative Marking and Stamping of Graphite Pressure Vessels	682
Nonmandatory Appendix NN	Guidance to the Responsibilities of the User and Designated Agent	683

FIGURES

UG-28	Diagrammatic Representation of Variables for Design of Cylindrical Vessels Subjected to External Pressure	20
UG-28.1	Diagrammatic Representation of Lines of Support for Design of Cylindrical Vessels Subjected to External Pressure	21
UG-29.1	Various Arrangements of Stiffening Rings for Cylindrical Vessels Subjected to External Pressure	25
UG-29.2	Maximum Arc of Shell Left Unsupported Because of Gap in Stiffening Ring of Cylindrical Shell Under External Pressure	26
UG-30	Some Acceptable Methods of Attaching Stiffening Rings	27
UG-33.1	Length L_c of Some Typical Conical Sections for External Pressure	31
UG-34	Some Acceptable Types of Unstayed Flat Heads and Covers	33

UG-36	Large Head Openings — Reverse-Curve and Conical Shell-Reducer Sections	38
UG-37	Chart for Determining Value of F , as Required in UG-37	41
UG-37.1	Nomenclature and Formulas for Reinforced Openings	42
UG-38	Minimum Depth for Flange of Flued-In Openings	43
UG-39	Multiple Openings in Rim of Heads With a Large Central Opening	44
UG-40	Some Representative Configurations Describing the Reinforcement Dimension t_e and the Opening Dimension d	46
UG-41.1	Nozzle Attachment Weld Loads and Weld Strength Paths to Be Considered	49
UG-42	Examples of Multiple Openings	51
UG-47	Acceptable Proportions for Ends of Stays	55
UG-53.1	Example of Tube Spacing With Pitch of Holes Equal in Every Row	56
UG-53.2	Example of Tube Spacing With Pitch of Holes Unequal in Every Second Row	57
UG-53.3	Example of Tube Spacing With Pitch of Holes Varying in Every Second and Third Row	57
UG-53.4	Example of Tube Spacing With Tube Holes on Diagonal Lines	58
UG-53.5	Diagram for Determining the Efficiency of Longitudinal and Diagonal Ligaments Between Openings in Cylindrical Shells	59
UG-53.6	Diagram for Determining Equivalent Longitudinal Efficiency of Diagonal Ligaments Between Openings in Cylindrical Shells	60
UG-80.1	Maximum Permissible Deviation From a Circular Form e for Vessels Under External Pressure	62
UG-80.2	Example of Differences Between Maximum and Minimum Inside Diameters in Cylindrical, Conical, and Spherical Shells	62
UG-84	Simple Beam Impact Test Specimens (Charpy Type Test)	64
UG-84.1	Charpy V-Notch Impact Test Requirements for Full Size Specimens for Carbon and Low Alloy Steels, Having a Specified Minimum Tensile Strength of Less Than 95 ksi, Listed in Table UCS-23	65
UG-84.1M	Charpy V-Notch Impact Test Requirements for Full Size Specimens for Carbon and Low Alloy Steels, Having a Specified Minimum Tensile Strength of Less Than 655 MPa, Listed in Table UCS-23	66
UG-84.5	HAZ Impact Specimen Removal	68
UG-116	Official Certification Mark to Denote the American Society of Mechanical Engineers' Standard	81
UG-118	Form of Stamping	86
UG-129.1	Official Certification Mark to Denote the American Society of Mechanical Engineers' Standard for Pressure Relief Valves	92
UG-129.2	Official Certification Mark to Denote the American Society of Mechanical Engineers' Standard for Nonreclosing Pressure Relief Devices	92
UW-3	Illustration of Welded Joint Locations Typical of Categories A, B, C, and D	111
UW-9	Butt Welding of Plates of Unequal Thickness	113
UW-13.1	Heads Attached to Shells	118
UW-13.2	Attachment of Pressure Parts to Flat Plates to Form a Corner Joint	121
UW-13.3	Typical Pressure Parts With Butt Welded Hubs	122
UW-13.4	Nozzle Necks Attached to Piping of Lesser Wall Thickness	123
UW-13.5	Fabricated Lap Joint Stub Ends for Lethal Service	123
UW-16.1	Some Acceptable Types of Welded Nozzles and Other Connections to Shells, Heads, etc.	125
UW-16.2	Some Acceptable Types of Small Standard Fittings	132
UW-16.3	Some Acceptable Types of Small Bolting Pads	134
UW-19.1	Typical Forms of Welded Staybolts	136
UW-19.2	Use of Plug and Slot Welds for Staying Plates	136
UW-20.1	Some Acceptable Types of Tube-to-Tubesheet Strength Welds	137
UW-21	Welds of Socket Weld Flanges to Nozzle Necks	139
UB-14	Examples of Filler Metal Application	157
UB-16	Some Acceptable Types of Brazed Joints	158
UCS-66	Impact Test Exemption Curves	177
UCS-66M	Impact Test Exemption Curves	180
UCS-66.1	Reduction in Minimum Design Metal Temperature Without Impact Testing	185
UCS-66.1M	Reduction in Minimum Design Metal Temperature Without Impact Testing	186

UCS-66.2	Diagram of UCS-66 Rules for Determining Lowest Minimum Design Metal Temperature (MDMT) Without Impact Testing	187
UCS-66.3	Some Typical Vessel Details Showing the Governing Thicknesses as Defined in UCS-66	189
UHA-51-1	Weld Metal Delta Ferrite Content	215
UHT-6.1	Charpy V-Notch Impact Test Requirements	233
UHT-6.1M	Charpy V-Notch Impact Test Requirements	233
UHT-18.1	Acceptable Welded Nozzle Attachment Readily Radiographed to Code Standards	235
UHT-18.2	Acceptable Full Penetration Welded Nozzle Attachments Radiographable With Difficulty and Generally Requiring Special Techniques Including Multiple Exposures to Take Care of Thickness Variations	236
ULW-2.1	Some Acceptable Layered Shell Types	244
ULW-2.2	Some Acceptable Layered Head Types	245
ULW-17.1	Transitions of Layered Shell Sections	247
ULW-17.2	Some Acceptable Solid Head Attachments to Layered Shell Sections	248
ULW-17.3	Some Acceptable Flat Heads and Tubesheets With Hubs Joining Layered Shell Sections	250
ULW-17.4	Some Acceptable Flanges for Layered Shells	251
ULW-17.5	Some Acceptable Layered Head Attachments to Layered Shells	252
ULW-17.6	Some Acceptable Welded Joints of Layered-to-Layered and Layered-to-Solid Sections	253
ULW-18.1	Some Acceptable Nozzle Attachments in Layered Shell Sections	255
ULW-22	Some Acceptable Supports for Layered Vessels	257
ULW-32.1	Solid-to-Layered and Layered-to-Layered Test Plates	259
ULW-32.2	.....	260
ULW-32.3	.....	260
ULW-32.4	.....	261
ULW-54.1	.....	262
ULW-54.2	.....	263
ULW-77	.....	265
ULT-82	.....	272
UHX-3	Terminology of Heat Exchanger Components	275
UHX-9	Some Representative Configurations Describing the Minimum Required Thickness of the Tubesheet Flanged Extension, h_r	277
UHX-10	Integral Channels	278
UHX-11.1	Tubesheet Geometry	279
UHX-11.2	Typical Untubed Lane Configurations	280
UHX-11.3	Curves for the Determination of E^*/E and ν^* (Equilateral Triangular Pattern)	282
UHX-11.4	Curves for the Determination of E^*/E and ν^* (Square Pattern)	283
UHX-12.1	U-Tube Tubesheet Configurations	285
UHX-12.2	Tube Layout Perimeter	286
UHX-13.1	Fixed Tubesheet Configurations	291
UHX-13.2	Z_d , Z_v , Z_w , and Z_m Versus X_a	294
UHX-13.3-1	F_m Versus X_a ($0.0 \leq Q_3 \leq 0.8$)	295
UHX-13.3-2	F_m Versus X_a ($-0.8 \leq Q_3 \leq 0.0$)	296
UHX-13.4	Shell With Increased Thickness Adjacent to the Tubesheets	297
UHX-14.1	Floating Tubesheet Heat Exchangers	306
UHX-14.2	Stationary Tubesheet Configurations	307
UHX-14.3	Floating Tubesheet Configurations	309
UIG-34-1	Typical Graphite Heat Exchanger	323
UIG-34-2	Configuration g Stationary Tubesheet	324
UIG-34-3	Configuration G Floating Tubesheet	324
UIG-36-1	Unacceptable Nozzle Attachment Details	325
UIG-36-2	Some Acceptable Nozzle Attachment Details in Impregnated Graphite Pressure Vessels	326
UIG-76-1	Tension Test Specimen	331
UIG-76-2	Cement Material Tension Test Specimen	332
UIG-76-3	Tube to Tubesheet Tension Test Specimen	333
UIG-76-4	Tube Cement Joint Tension Test Specimen	334
UIG-76-5	Tube Tension Test Specimen	335

1-4	Principal Dimensions of Typical Heads	353
1-6	Dished Covers With Bolting Flanges	358
1-7-1	.....	361
1-7-2	.....	362
1-9	.....	366
1-10-1	Nomenclature for Reinforced Openings	369
1-10-2	Nomenclature for Variable Thickness Openings	370
1-10-3	Radial Nozzle in a Cylindrical Shell	370
1-10-4	Nozzle in a Cylindrical Shell Oriented at an Angle From the Longitudinal Axis	370
1-10-5	Radial Nozzle in a Conical Shell	371
1-10-6	Nozzle in a Conical Shell Oriented Perpendicular to Longitudinal Axis	372
2-4	Types of Flanges	377
2-7.1	Values of T , U , Y , and Z	386
2-7.2	Values of F (Integral Flange Factors)	387
2-7.3	Values of V (Integral Flange Factors)	388
2-7.4	Values of F_L (Loose Hub Flange Factors)	389
2-7.5	Values of V_L (Loose Hub Flange Factors)	389
2-7.6	Values of f	390
2-13.1	Reverse Flange	393
2-13.2	Loose Ring Type Reverse Flange	394
4-1	Aligned Rounded Indications	400
4-2	Groups of Aligned Rounded Indications	401
4-3	Charts for t Equal to $\frac{1}{8}$ in. to $\frac{1}{4}$ in. (3 mm to 6 mm), Inclusive	402
4-4	Charts for t Over $\frac{1}{4}$ in. to $\frac{3}{8}$ in. (6 mm to 10 mm), Inclusive	403
4-5	Charts for t Over $\frac{3}{8}$ in. to $\frac{3}{4}$ in. (10 mm to 19 mm), Inclusive	404
4-6	Charts for t Over $\frac{3}{4}$ in. to 2 in. (19 mm to 50 mm), Inclusive	405
4-7	Charts for t Over 2 in. to 4 in. (50 mm to 100 mm), Inclusive	406
4-8	Charts for t Over 4 in. (100 mm)	407
5-1	Typical Flanged-and-Flued or Flanged-Only Flexible Elements	408
5-2	Typical Nozzle Attachment Details Showing Minimum Length of Straight Flange	409
9-2	Some Acceptable Types of Jacketed Vessels	419
9-5	Some Acceptable Types of Jacket Closures	421
9-6	Some Acceptable Types of Penetration Details	425
9-7	.....	426
11-1	Constant C for Gas or Vapor Related to Ratio of Specific Heats ($k = c_p/c_v$)	431
11-1M	Constant C for Gas or Vapor Related to Ratio of Specific Heats ($k = c_p/c_v$)	431
11-2	Flow Capacity Curve for Rating Nozzle-Type Safety Valves on Saturated Water (Based on 10% Overpressure)	433
11-2M	Flow Capacity Curve for Rating Nozzle-Type Safety Valves on Saturated Water (Based on 10% Overpressure)	433
13-2(a)	Vessels of Rectangular Cross Section	436
13-2(b)	Vessels of Obround Cross Section	440
13-2(c)	Vessel of Circular Cross Section With Central Dividing Plate	441
13-6	Plate With Multidiameter Hole Pattern	445
13-14(a)	.....	459
13-14(b)	Orientation of Panel Dimensions and Stresses	459
14-1	Integral Flat Head With Large Central Opening	466
14-2	.....	466
14-3	.....	468
17-1	Two Embossed Plates	471
17-2	Two Dimpled Plates	471
17-3	Embossed Plate to Plain Plate	471
17-4	Arc-Spot-Welded Two-Layer Assembly	472
17-5	Dimpled Plate Welded to Plain Plate	472
17-6	Three-Ply Assemblies	473
17-7	Single-Spot-Weld Tension Specimen, Two-Ply Joint	473

17-8	Seam-Weld Specimen for Tension and Macrosection, Two-Ply Joint	475
17-9	Single Spot-Weld Tension Specimen for Three-Ply Joint	476
17-10	Seam-Weld Specimen for Tension and Macrosection for Three-Ply Joint	476
17-11	Gas Metal Arc-Spot-Weld Block for Macrosections and Strength Tests	477
17-12	Gas Metal Arc-Spot-Weld Block for Bend Tests	478
17-13	Gas Tungsten-Arc Seam Weld, Plasma-Arc Seam Weld, Submerged-Arc Seam Weld, and Laser Beam Seam Weld Test Specimen for Bend Tests	479
17-14	.....	480
17-15	.....	480
17-16	Peel Test	480
17-17	Complete Penetration Welding Per 17-1(c)	481
22-1	Typical Sections of Special Seamless Vessels	486
24-1	Typical Hub and Clamp	491
24-2	Typical Clamp Lug Configurations	492
26-1-1	Typical Bellows Expansion Joints	499
26-1-2	Starting Points for the Measurement of the Length of Shell on Each Side of the Bellows	500
26-2	Dimensions to Determine I_{xx}	502
26-3	Possible Convolution Profile in the Neutral Position	504
26-4	Coefficient C_p	505
26-5	Coefficient C_f	506
26-6	Coefficient C_d	509
26-7	Bellows Subjected to an Axial Displacement x	512
26-8	Bellows Subjected to a Lateral Deflection y	514
26-9	Bellows Subjected to an Angular Rotation θ	515
26-10	Cyclic Displacements	516
26-11	Cyclic Displacements	517
26-12	Cyclic Displacements	517
26-13	Some Typical Expansion Bellows to Weld End Details	518
26-14	Toroidal Bellows Manufacturing Tolerances	519
28-1	.....	526
30-1	Thickness Ratio Versus Diameter Ratio	528
31-1	.....	531
32-3	Nomenclature	534
32-6.1	Limits for Torispherical Head	535
32-6.2	Limits for Ellipsoidal Head	535
32-6.3	Limits for Hemispherical Head	536
36-4-1	Test Specimen Arrangement	544
39-4-1	Schematic Diagram of Vacuum Apparatus	550
40-3-1	Typical Equipment (Dilometer) for Thermal Expansion Test	551
40-6-1	Typical Recording Curve in Thermal Expansion Test, $\Delta L_t = f(\theta)$	552
41-1.1-1	EIH Support Plate Gasketed With Mating Flange	554
41-4-1	Typical EIH Support Plate and Element Geometry	555
41-5-1	Some Representative Configurations Describing the Minimum Required Thickness of the EIH Support Plate Flanged Extension, h_r	556
A-2	Some Acceptable Types of Tube-to-Tubesheet Welds	568
A-3	Typical Test Fixtures for Expanded or Welded Tube-to-Tubesheet Joints	569
K-2	Some Acceptable Types of Filler Plugs	580
L-1.4.1	Joint Efficiency and Weld Joint Type — Cylinders and Cones	582
L-1.4-2	Joint Efficiency and Weld Joint Type — Heads	583
L-1.4-3	Joint Efficiencies for Categories A and D Welded Joints in Shells, Heads, or Cones	584
L-1.4-4	Joint Efficiencies for Categories B and C Welded Joints in Shells or Cones	585
L-11-1	Single-Chamber Pressure Vessel	586
L-11-2	Single-Chamber Pressure Vessel Operating With Partial Vacuum	587
L-11-3	Shell and Tube Exchanger, With Shell and Tube Operating as Independent Chambers	587
W-3.1	Example of the Use of Form U-4	625
Y-3.1	.....	633

Y-3.2	Flange Dimensions and Forces	634
Y-5.1.1	Class 1 Flange Assembly (Identical Flange Pairs)	636
Y-5.1.2	Class 2 Flange Assembly	636
Y-5.1.3	Class 3 Flange Assembly	637
DD-1	Sample Certificate of Authorization	646
EE-1	NPS 2 Pipe Jacket	648
EE-2	NPS 3 Pipe Jacket	649
EE-3	NPS 4 Pipe Jacket	650
EE-4		651
EE-5		651
JJ-1.2-1	Austenitic Stainless Steel Base Metal and HAZ Toughness Testing Requirements	668
JJ-1.2-2	Welding Procedure Qualification With Toughness Testing Requirements for Austenitic Stainless Steel	669
JJ-1.2-3	Welding Consumable Pre-Use Testing Requirements for Austenitic Stainless Steel	670
JJ-1.2-4	Production Toughness Testing Requirements for Austenitic Stainless Steel	671
JJ-1.2-5	Austenitic-Ferritic Duplex, Ferritic Chromium, and Martensitic Stainless Steel Toughness Testing Requirements	672
LL-1	Graphical Representation of $F_{t,min}$	680
LL-2	Graphical Representation of $F_{t,max}$	681

TABLES

U-3	Year of Acceptable Edition of Referenced Standards in This Division	5
UG-33.1	Values of Spherical Radius Factor K_o for Ellipsoidal Head With Pressure on Convex Side	30
UG-37	Values of Spherical Radius Factor K_1	43
UG-43	Minimum Number of Pipe Threads for Connections	52
UG-45	Nozzle Minimum Thickness Requirements	53
UG-79-1	Equations for Calculating Forming Strains	61
UG-84.2	Charpy Impact Test Temperature Reduction Below Minimum Design Metal Temperature	67
UG-84.3	Specifications for Impact Tested Materials in Various Product Forms	67
UG-84.4	Impact Test Temperature Differential	67
UG-84.6	Required HAZ Impact Test Specimen Set Removal	68
UW-12	Maximum Allowable Joint Efficiencies for Arc and Gas Welded Joints	115
UW-16.1	Minimum Thickness Required by UW-16(f)(3)(-a)(-6)	131
UW-33		142
UB-2	Maximum Design Temperatures for Brazing Filler Metal	155
UB-17	Recommended Joint Clearances at Brazing Temperature	158
UCS-23	Carbon and Low Alloy Steel	164
UCS-56-1	Postweld Heat Treatment Requirements for Carbon and Low Alloy Steels — P-No. 1	167
UCS-56-2	Postweld Heat Treatment Requirements for Carbon and Low Alloy Steels — P-No. 3	168
UCS-56-3	Postweld Heat Treatment Requirements for Carbon and Low Alloy Steels — P-No. 4	169
UCS-56-4	Postweld Heat Treatment Requirements for Carbon and Low Alloy Steels — P-Nos. 5A, 5B, and 5C	170
UCS-56-5	Postweld Heat Treatment Requirements for Carbon and Low Alloy Steels — P-No. 9A	171
UCS-56-6	Postweld Heat Treatment Requirements for Carbon and Low Alloy Steels — P-No. 9B	172
UCS-56-7	Postweld Heat Treatment Requirements for Carbon and Low Alloy Steels — P-No. 10A	173
UCS-56-8	Postweld Heat Treatment Requirements for Carbon and Low Alloy Steels — P-No. 10B	173
UCS-56-9	Postweld Heat Treatment Requirements for Carbon and Low Alloy Steels — P-No. 10C	174
UCS-56-10	Postweld Heat Treatment Requirements for Carbon and Low Alloy Steels — P-No. 10F	174
UCS-56-11	Postweld Heat Treatment Requirements for Carbon and Low Alloy Steels — P-No. 15E	175
UCS-56.1	Alternative Postweld Heat Treatment Requirements for Carbon and Low Alloy Steels	176
UCS-57	Thickness Above Which Full Radiographic Examination of Butt Welded Joints Is Mandatory	176
UCS-66	Tabular Values for Figure UCS-66 and Figure UCS-66M	183
UCS-79-1	Post-Cold-Forming Strain Limits and Heat Treatment Requirements for P-No. 15E Materials	193
UNF-23.1	Nonferrous Metals — Aluminum and Aluminum Alloy Products	197
UNF-23.2	Nonferrous Metals — Copper and Copper Alloys	197
UNF-23.3	Nonferrous Metals — Nickel, Cobalt, and High Nickel Alloys	198

UNF-23.4	Nonferrous Metals — Titanium and Titanium Alloys	199
UNF-23.5	Nonferrous Metals — Zirconium	199
UNF-79	Postfabrication Strain Limits and Required Heat Treatment	202
UHA-23	High Alloy Steel	207
UHA-32-1	Postweld Heat Treatment Requirements for High Alloy Steels — P-No. 6	209
UHA-32-2	Postweld Heat Treatment Requirements for High Alloy Steels — P-No. 7	210
UHA-32-3	Postweld Heat Treatment Requirements for High Alloy Steels — P-No. 8	210
UHA-32-4	Postweld Heat Treatment Requirements for High Alloy Steels — P-No. 10H	211
UHA-32-5	Postweld Heat Treatment Requirements for High Alloy Steels — P-No. 10I	211
UHA-32-6	Postweld Heat Treatment Requirements for High Alloy Steels — P-No. 10K	212
UHA-44	Postfabrication Strain Limits and Required Heat Treatment	213
UCI-23	Maximum Allowable Stress Values in Tension for Cast Iron	220
UCI-78.1	.....	221
UCI-78.2	.....	221
UCD-23	Maximum Allowable Stress Values in Tension for Cast Ductile Iron, ksi (MPa)	229
UCD-78.1	.....	230
UCD-78.2	.....	230
UHT-23	Ferritic Steels With Properties Enhanced by Heat Treatment	237
UHT-56	Postweld Heat Treatment Requirements for Materials in Table UHT-23	238
ULT-23	Maximum Allowable Stress Values in Tension for 5%, 8%, and 9% Nickel Steels, Type 304 Stainless Steel, and 5083-0 Aluminum Alloy at Cryogenic Temperatures for Welded and Nonwelded Construction	268
ULT-82	Minimum Tensile Strength Requirements for Welding Procedure Qualification Tests on Tension Specimens Conforming to QW-462.1	271
ULT-82M	Minimum Tensile Strength Requirements for Welding Procedure Qualification Tests on Tension Specimens Conforming to QW-462.1	272
UHX-8.1	Tubesheet Effective Bolt Load, W^*	276
UHX-12.4-1	.....	287
UHX-13.1	Formulas for Determination of Z_d , Z_v , Z_m , Z_w , and F_m	292
UHX-13.2	Formulas for the Determination of $F_{t, \min}$ and $F_{t, \max}$	293
UHX-13.4-1	.....	296
UHX-13.4-2	.....	297
UHX-13.8.4-1	.....	304
UHX-14.4-1	.....	310
UHX-14.6.4-1	.....	315
UHX-17	Flanged-and-Flued or Flanged-Only Expansion Joint Load Cases and Stress Limits	317
UIG-6-1	Properties of Certified Material	321
UIG-84-1	Test Frequency for Certified Materials	336
1-4.1	Values of Factor K	353
1-4.2	Values of Factor M	354
1-4.3	Maximum Metal Temperature	354
1-4.4	Values of Knuckle Radius, r	355
1-5.1	Values of Δ for Junctions at the Large Cylinder for $\alpha \leq 30$ deg	356
1-5.2	Values of Δ for Junctions at the Small Cylinder for $\alpha \leq 30$ deg	356
1-8.1	Values of Δ for Junctions at the Large Cylinder for $\alpha \leq 60$ deg	363
2-4	Recommended Minimum Gasket Contact Widths for Sheet and Composite Gaskets	380
2-5.1	Gasket Materials and Contact Facings	381
2-5.2	Effective Gasket Width	383
2-6	Moment Arms for Flange Loads Under Operating Conditions	384
2-7.1	Flange Factors in Formula Form	391
2-14	Flange Rigidity Factors	395
4-1	.....	399
11-1	Molecular Weights of Gases and Vapors	432
13-8(d)	.....	448
13-8(e)	.....	452
13-13(c)	.....	458

13-18.1	.....	463
13-18(b)	.....	464
24-8	Allowable Design Stress for Clamp Connections	495
26-8	Tabular Values for Coefficients B_1, B_2, B_3	513
26-10-1	U-Shaped Unreinforced and Reinforced Bellows Manufacturing Tolerances	516
26-15.1a	Polynomial Coefficients α_i for the Determination of C_p When $C_1 \leq 0.3$	519
26-15.1b	Polynomial Coefficients α_i for the Determination of C_p When $C_1 > 0.3$	520
26-15.2	Polynomial Coefficients β_i for the Determination of C_f	520
26-15.3	Polynomial Coefficients γ_i for the Determination of C_d	520
31-1	Material Specifications	530
31-2	Composition Requirements for $2\frac{1}{4}\text{Cr}-1\text{Mo}-\frac{1}{4}\text{V}$ Weld Metal	531
33-1	Standard Units for Use in Equations	537
34-1	Material Specifications	538
34-2	Additional Requirements	539
42-5.1-1	.....	560
44-4-1	Allowable Materials and Design Stress	562
A-2	Efficiencies f_r	567
P-1	Criteria for Establishing Allowable Stress Values	595
W-3	Instructions for the Preparation of Manufacturer's Data Reports	619
W-3.1	Supplementary Instructions for the Preparation of Manufacturer's Data Reports for Layered Vessels	626
W-3.2	Supplementary Instructions for the Preparation of Manufacturer's or Assembler's Certificate of Conformance Forms UV-1 and UD-1	629
Y-6.1	Summary of Applicable Equations for Different Classes of Assemblies and Different Categories of Flanges	638
Y-9.1	Trial Flange Thickness and Area of Bolting for Various Classes of Assemblies and Flange Categories	642
QEXP-1	Instructions for Filling Out TEPS Form	663
KK-1	Instructions for the Preparation of User's Design Requirements	678
NN-6-1	Responsibilities of the User	686
NN-6-2	Matters of Agreement Between the User and the Manufacturer	687
NN-6-3	The Manufacturer's Responsibility to the User	687
NN-6-4	Recommendations to the User	687
NN-6-5	Responsibilities of the User or His Designated Agent	688
NN-6-6	Matters of Agreement Between the User or His Designated Agent and the Manufacturer	688
NN-6-7	The Manufacturer's Responsibility to the User or His Designated Agent	689
NN-6-8	Recommendations to the User or His Designated Agent	689
NN-6-9	Cautionary Advice Provided to the User	689
NN-6-10	Guidance Code to Users and Their Designated Agents	690
NN-6-11	User-Manufacturer Rules	690
FORMS		
CMQ	Certified Material Qualification Form (Used in the Construction of Graphite Pressure Vessels) ...	339
CCQ	Certified Cement Qualification	346
CPQ	Cementing Procedure Qualification Form	348
CTQ	Cementing Technician Qualification Form (Used in Cementing Parts of Graphite Pressure Vessels)	350
26-1	Form 26-1 Specification Sheet for ASME Section VIII, Division 1 Mandatory Appendix 26 Bellows Expansion Joints	521
26-1M	Form 26-1M Specification Sheet for ASME Section VIII, Division 1 Mandatory Appendix 26 Bellows Expansion Joints	522
U-1	Manufacturer's Data Report for Pressure Vessels	602
U-1A	Manufacturer's Data Report for Pressure Vessels	605
U-1B	Manufacturer's Supplementary Data Report for Graphite Pressure Vessels	607
U-2	Manufacturer's Partial Data Report	608
U-2A	Manufacturer's Partial Data Report (Alternative Form)	611

U-3	Manufacturer's Certificate of Compliance Covering Pressure Vessels to be Stamped with the UM Designator [See U-1(j)]	613
U-3A	Manufacturer's Certificate of Compliance (Alternative Form) Covering Pressure Vessels to be Stamped with the UM Designator [See U-1(j)]	615
U-4	Manufacturer's Data Report Supplementary Sheet	617
U-5	Manufacturer's Data Report Supplementary Sheet Shell-and-Tube Heat Exchangers	618
UV-1	Manufacturer's or Assembler's Certificate of Conformance for Pressure Relief Valves	627
UD-1	Manufacturer's Certificate of Conformance for Rupture Disk Devices	628
QEXP-1	Tube Expanding Procedure Specification (TEPS)	661
QEXP-2	Suggested Format for Tube-to-Tubesheet Expanding Procedure Qualification Record for Test Qualification (TEPQR)	665
U-DR-1	User's Design Requirements for Single Chamber Pressure Vessels	674
U-DR-2	User's Design Requirements for Multi-chamber Pressure Vessels	676
ENDNOTES		691
INDEX		699

(13)

LIST OF SECTIONS

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 (Customary)
 - Part D — Properties (Metric)
- III Rules for Construction of Nuclear Facility Components
 - Subsection NCA — General Requirements for Division 1 and Division 2
 - Appendices
 - Division 1
 - Subsection NB — Class 1 Components
 - Subsection NC — Class 2 Components
 - Subsection ND — Class 3 Components
 - Subsection NE — Class MC Components
 - Subsection NF — Supports
 - Subsection NG — Core Support Structures
 - Subsection NH — Class 1 Components in Elevated Temperature Service
 - Division 2 — Code for Concrete Containments
 - Division 3 — Containments for Transportation and Storage of Spent Nuclear Fuel and High Level Radioactive Material and Waste
 - Division 5 — High Temperature Reactors
- 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, Brazing, and Fusing Qualifications
- X Fiber-Reinforced Plastic Pressure Vessels
- XI Rules for Inservice Inspection of Nuclear Power Plant Components
- XII Rules for Construction and Continued Service of Transport Tanks

INTERPRETATIONS

ASME issues written replies to inquiries concerning interpretation of technical aspects of the Code.

Interpretations of the Code are posted in January and July at <http://cstools.asme.org/interpretations.cfm>. Any Interpretations issued during the previous two calendar years are included with the publication of the applicable Section of the Code. Interpretations of Section III, Divisions 1 and 2 and Section III Appendices are included with Subsection NCA.

CODE CASES

The Boiler and Pressure Vessel Code committees meet 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 2013 Code Cases book: “Boilers and Pressure Vessels” or “Nuclear Components.” Supplements will be sent automatically to the purchasers of the Code Cases books up to the publication of the 2015 Code.

FOREWORD

(This Foreword is provided as an aid to the user and is not part of the rules of this Code.)

In 1911, The American Society of Mechanical Engineers established the Boiler and Pressure Vessel Committee to formulate standard rules for the construction of steam boilers and other pressure vessels. In 2009, the Boiler and Pressure Vessel Committee was superseded by the following committees:

- (a) Committee on Power Boilers (I)
- (b) Committee on Materials (II)
- (c) Committee on Construction of Nuclear Facility Components (III)
- (d) Committee on Heating Boilers (IV)
- (e) Committee on Nondestructive Examination (V)
- (f) Committee on Pressure Vessels (VIII)
- (g) Committee on Welding, Brazing, and Fusing (IX)
- (h) Committee on Fiber-Reinforced Plastic Pressure Vessels (X)
- (i) Committee on Nuclear Inservice Inspection (XI)
- (j) Committee on Transport Tanks (XII)

Where reference is made to “the Committee” in this Foreword, each of these committees is included individually and collectively.

The Committee's function is to establish rules of safety relating only to pressure integrity, which govern the construction^{*} of boilers, pressure vessels, transport tanks, and nuclear components, and the inservice inspection of nuclear components and transport tanks. The Committee also interprets 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, or nuclear components, or the inservice inspection of nuclear components or transport tanks. Users of the Code should refer to the pertinent codes, standards, laws, regulations, or other relevant documents for safety issues other than those relating to pressure integrity. Except for Sections XI and XII, and with a few other 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. In formulating the rules, the Committee considers the needs of users, manufacturers, and inspectors of pressure vessels. The objective of the rules is to afford reasonably certain protection of life and property, and to provide a margin for deterioration in service to give a reasonably long, safe period of usefulness. Advancements in design and materials and evidence of experience have been recognized.

This Code contains mandatory requirements, specific prohibitions, and nonmandatory guidance for construction activities and inservice inspection and testing activities. The Code does not address all aspects of these activities and those aspects that 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 judgement* refers to technical judgments made by knowledgeable engineers 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.

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 the application of these programs to their design.

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

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 Committee meets regularly to consider revisions of the rules, new rules as dictated by technological development, Code Cases, and requests for interpretations. Only the 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 Submittal of Technical Inquiries to the Boiler and Pressure Vessel Standards Committees). Proposed revisions to the Code resulting from inquiries will be presented to the Committee for appropriate action. The action of the Committee becomes effective only after confirmation by 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 (ANSI) and published at <http://cstools.asme.org/csconnect/public/index.cfm?PublicReview=Revisions> to invite comments from all interested persons. After public review and final approval by ASME, revisions are published at regular intervals in Editions of the Code.

The 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 Committee. ASME is to be notified should questions arise concerning improper use of an ASME Certification Mark.

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 THE CERTIFICATION MARK 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 the Certification Mark 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 Certification Mark for the benefit of the users, the enforcement jurisdictions, and the holders of the Certification Mark who comply with all requirements.

Based on these objectives, the following policy has been established on the usage in advertising of facsimiles of the Certification Mark, 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 the Certification Mark 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.” An ASME corporate logo shall not be used by any organization other than ASME.

The Certification Mark 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 the Certification Mark who may also use the facsimile in advertising to show that clearly specified items will carry the Certification Mark. General usage is permitted only when all of a manufacturer’s items are constructed under the rules.

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 Certification Mark described in the governing Section of the Code.

Markings such as “ASME,” “ASME Standard,” or any other marking including “ASME” or the Certification Mark 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.

(13) SUBMITTAL OF TECHNICAL INQUIRIES TO THE BOILER AND PRESSURE VESSEL STANDARDS COMMITTEES

1 INTRODUCTION

(a) The following information provides guidance to Code users for submitting technical inquiries to the committees. See Guideline on the Approval of New Materials Under the ASME Boiler and Pressure Vessel Code in Section II, Parts C and D for additional requirements for requests involving adding new materials to the Code. Technical inquiries include requests for revisions or additions to the Code rules, requests for Code Cases, and requests for Code Interpretations, as described below.

(1) *Code Revisions.* Code revisions are considered to accommodate technological developments, address administrative requirements, incorporate Code Cases, or to clarify Code intent.

(2) *Code Cases.* Code Cases represent alternatives or additions to existing Code rules. Code Cases are written as a question and reply, and are usually intended to be incorporated into the Code at a later date. When used, Code Cases prescribe mandatory requirements in the same sense as the text of the Code. However, users are cautioned that not all jurisdictions or owners automatically accept Code Cases. The most common applications for Code Cases are:

(-a) to permit early implementation of an approved Code revision based on an urgent need

(-b) to permit the use of a new material for Code construction

(-c) to gain experience with new materials or alternative rules prior to incorporation directly into the Code

(3) *Code Interpretations.* Code Interpretations provide clarification of the meaning of existing rules in the Code, and are also presented in question and reply format. Interpretations do not introduce new requirements. In cases where existing Code text does not fully convey the meaning that was intended, and revision of the rules is required to support an interpretation, an Intent Interpretation will be issued and the Code will be revised.

(b) The Code rules, Code Cases, and Code Interpretations established by the committees are not to be considered as approving, recommending, certifying, or endorsing any proprietary or specific design, or as limiting in any way the freedom of manufacturers, constructors, or owners to choose any method of design or any form of construction that conforms to the Code rules.

(c) Inquiries that do not comply with these provisions or that do not provide sufficient information for a committee's full understanding may result in the request being returned to the inquirer with no action.

2 INQUIRY FORMAT

Submittals to a committee shall include:

(a) *Purpose.* Specify one of the following:

(1) revision of present Code rules

(2) new or additional Code rules

(3) Code Case

(4) Code Interpretation

(b) *Background.* Provide the information needed for the committee's understanding of the inquiry, being sure to include reference to the applicable Code Section, Division, Edition, Addenda (if applicable), paragraphs, figures, and tables. Preferably, provide a copy of the specific referenced portions of the Code.

(c) *Presentations.* The inquirer may desire or be asked to attend a meeting of the committee to make a formal presentation or to answer questions from the committee members with regard to the inquiry. Attendance at a committee meeting shall be at the expense of the inquirer. The inquirer's attendance or lack of attendance at a meeting shall not be a basis for acceptance or rejection of the inquiry by the committee.

3 CODE REVISIONS OR ADDITIONS

Requests for Code revisions or additions shall provide the following:

(a) *Proposed Revisions or Additions.* For revisions, identify the rules of the Code that require revision and submit a copy of the appropriate rules as they appear in the Code, marked up with the proposed revision. For additions, provide the recommended wording referenced to the existing Code rules.

(b) *Statement of Need.* Provide a brief explanation of the need for the revision or addition.

(c) *Background Information.* Provide background information to support the revision or addition, including any data or changes in technology that form the basis for the request that will allow the committee to adequately evaluate the proposed revision or addition. Sketches, tables, figures, and graphs should be submitted as appropriate. When applicable, identify any pertinent paragraph in the Code that would be affected by the revision or addition and identify paragraphs in the Code that reference the paragraphs that are to be revised or added.

4 CODE CASES

Requests for Code Cases shall provide a Statement of Need and Background Information similar to that defined in 3(b) and 3(c), respectively, for Code revisions or additions. The urgency of the Code Case (e.g., project underway or imminent, new procedure, etc.) must be defined and it must be confirmed that the request is in connection with equipment that will bear the Certification Mark, with the exception of Section XI applications. The proposed Code Case should identify the Code Section and Division, and be written as a *Question* and a *Reply* in the same format as existing Code Cases. Requests for Code Cases should also indicate the applicable Code Editions and Addenda (if applicable) to which the proposed Code Case applies.

5 CODE INTERPRETATIONS

(a) Requests for Code Interpretations shall provide the following:

(1) *Inquiry.* Provide a condensed and precise question, omitting superfluous background information and, when possible, composed in such a way that a “yes” or a “no” *Reply*, with brief provisos if needed, is acceptable. The question should be technically and editorially correct.

(2) *Reply.* Provide a proposed *Reply* that will clearly and concisely answer the *Inquiry* question. Preferably, the *Reply* should be “yes” or “no,” with brief provisos if needed.

(3) *Background Information.* Provide any background information that will assist the committee in understanding the proposed *Inquiry* and *Reply*.

(b) Requests for Code Interpretations must be limited to an interpretation of a particular requirement in the Code or a Code Case. The committee cannot consider consulting type requests such as the following:

(1) a review of calculations, design drawings, welding qualifications, or descriptions of equipment or parts to determine compliance with Code requirements;

(2) a request for assistance in performing any Code-prescribed functions relating to, but not limited to, material selection, designs, calculations, fabrication, inspection, pressure testing, or installation;

(3) a request seeking the rationale for Code requirements.

6 SUBMITTALS

Submittals to and responses from the committees shall meet the following:

(a) *Submittal.* Inquiries from Code users shall be in English and preferably be submitted in typewritten form; however, legible handwritten inquiries will also be considered. They shall include the name, address, telephone number, fax number, and e-mail address, if available, of the inquirer and be mailed to the following address:

Secretary
ASME Boiler and Pressure Vessel Committee
Two Park Avenue
New York, NY 10016-5990

As an alternative, inquiries may be submitted via e-mail to: SecretaryBPV@asme.org.

(b) *Response.* The Secretary of the appropriate committee shall acknowledge receipt of each properly prepared inquiry and shall provide a written response to the inquirer upon completion of the requested action by the committee.

PERSONNEL

ASME Boiler and Pressure Vessel Standards Committees, Subgroups, and Working Groups

January 1, 2013

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SUMMARY OF CHANGES

The 2013 Edition of this Code contains revisions in addition to the 2010 Edition with 2011 Addenda.

After publication of the 2013 Edition, Errata to the BPV Code may be posted on the ASME Web site to provide corrections to incorrectly published items, or to correct typographical or grammatical errors in the BPV Code. Such Errata shall be used on the date posted.

Information regarding Special Notices and Errata is published on the ASME Web site under the BPVC Resources page at <http://www.asme.org/kb/standards/publications/bpvc-resources>.

Changes given below are identified on the pages by a margin note, **(13)**, placed next to the affected area.

The Record Numbers listed below are explained in more detail in “List of Changes in Record Number Order” following this Summary of Changes.

<i>Page</i>	<i>Location</i>	<i>Change (Record Number)</i>
xxv	List of Sections	Revised (12-749)
xxvii	Foreword	Revised in its entirety (09-760)
xxx	Submittal of Technical Inquiries to the Boiler and Pressure Vessel Standards Committees	Revised (12-1641)
xxxii	Personnel	Updated
lx	Cross-Referencing and Stylistic Changes in the Boiler and Pressure Vessel Code	Added
1	U-1	Subparagraph(c)(2)(-d) revised (12-526)
3	U-2	Subparagraph (a) revised (06-788)
4	U-3	First sentence of subpara. (a) revised (09-1148)
5	Table U-3	Revised (11-1240)
8	UG-6	Subparagraph (c) added (12-2051)
10	UG-11	Subparagraphs (a) and (c)(5) revised (11-253, 11-987, 12-370)
13	UG-16	Subparagraph (f) added (12-904)
14	UG-20	Subparagraph (f)(2) revised (11-2185)
18	UG-27	In subpara. (c)(2), endnote 20 revised (12-904)
19	UG-28(c)	In subpara. (1), last sentence of Step 8 deleted (12-904)
21	Figure UG-28.1	Note (1) revised (11-442)
22	UG-28(d)	Last sentence of Step 6 deleted (12-904)
22	UG-29	In subpara. (a), last sentence of Step 8 deleted (12-904)
24	UG-30	Last sentence of subpara. (e) deleted (12-904)
28	UG-32	(1) In subpara. (a), endnote 23 revised (12-904) (2) In subpara. (e), second paragraph revised (11-1898)

<i>Page</i>	<i>Location</i>	<i>Change (Record Number)</i>
29	UG-33	(1) In subparas. (c) and (e); subpara. (d), Step 2; and subpara. (f)(1), Step 8, last sentence deleted (12-904) (2) Subparagraph (f) revised (11-442)
36	UG-35.2	Subparagraphs (c)(1) and (e) revised (06-788)
37	“Openings and Reinforcements”	In-text Note deleted (12-904)
41	UG-37(g)	Revised (08-1428)
48	UG-41	In subparas. (b)(1) and (b)(2), references to L-7 examples deleted (12-904)
54	UG-47	Subparagraph (f) revised (10-288)
61	UG-79	(1) Title and subpara. (a) revised (12-237) (2) Subparagraph (d) added (10-631)
61	Table UG-79-1	Added (12-237)
61	UG-80(b)	Subparagraph (10) deleted (12-904)
68	Figure UG-84.5	Added (00-211)
68	Table UG-84.6	Added (00-211)
68	UG-84(f)(2)	Revised (11-83)
69	UG-84(g)(2)	Revised (00-211)
69	UG-84(h)	(1) Subparagraph (3) revised (00-211) (2) Subparagraph (4) corrected by errata (11-2242)
70	UG-84(i)(3)(-a)(-1)	Revised (11-2183)
75	UG-99(k)	Revised (04-349)
75	UG-100	Subparagraphs (d) and (e) revised (04-349, 07-260)
76	UG-101	Subparagraph (a)(1)(-a) corrected by errata (11-1680)
81	UG-116	(1) Subparagraph (a)(3) revised (07-225) (2) Subparagraph (a)(4) deleted, and subsequent subparagraphs renumbered (07-225)
81	Figure UG-116	Certification Mark corrected by errata (11-1676)
83	UG-117	Subparagraphs (a), (a)(2)(-c), and (a)(3) revised (11-1398, 12-735)
85	UG-118	Revised in its entirety (11-861)
86	Figure UG-118	(1) Certification Mark corrected by errata (11-1676) (2) General Note revised (07-225) (3) Note (2) added (07-225)
86	UG-120	Subparagraph (a)(4) revised (12-735)
88	UG-125	Subparagraph (a) revised (12-1132)
89	UG-126	Subparagraph (c) revised (08-488)
91	UG-129	Subparagraphs (a), (a)(7), (d), (e), (e)(8), (e)(9), (e)(10), (f), and (f)(9) revised (09-2013, 12-401)
92	Figure UG-129.1	Corrected by errata (11-1676)
92	Figure UG-129.2	Corrected by errata (11-1676)

<i>Page</i>	<i>Location</i>	<i>Change (Record Number)</i>
96	UG-131(e)(7)	Revised (08-487)
101	UG-136(b)	In-text Note following subpara. (2) revised (06-788)
107	UG-140	Subparagraph (b)(2) revised (12-403)
109	UW-2	(1) Subparagraphs (a)(1)(-a), (b)(1), (b)(4)(-a), and (b)(4)(-b) revised (04-1635, 10-1702) (2) Last sentence of subpara. (a)(2) deleted (04-1635)
110	UW-3	Subparagraph (b) corrected by errata (12-1736)
112	UW-6	Added (04-690)
125	Figure UW-16.1	Sketch (a-4) added (11-06)
131	UW-16(f)(4)	Corrected by errata (13-130)
135	UW-19	Subparagraphs (a)(2), (c), and (c)(2) revised (09-279, 10-288)
139	Figure UW-21	(1) Label for sketches (1), (2), and (3) revised (10-1796) (2) Sketch (1) corrected by errata (11-1680)
140	UW-27	Subparagraph (a)(3) revised (09-991)
141	UW-34	First sentence revised (11-475)
142	UW-35	SI Units in in-text table of subpara. (d) revised (11-471)
145	UW-40(f)(5)(-h)	Added (04-1628)
146	UW-51	Subparagraph (a)(4) revised (11-1158)
146	UW-52	Subparagraph (c) corrected by errata (11-733)
164	Table UCS-23	(1) Revised (08-1609, 08-1790, 09-299, 09-739, 10-286, 11-877, 12-482) (2) "Type/Grade" entry for SA/EN 10028-2 corrected by errata (11-1680)
164	UCS-28	Subparagraph (b) deleted, and subpara. (c) redesignated (12-904)
165	UCS-29	Last sentence deleted (12-904)
165	UCS-33	Last sentence deleted (12-904)
165	UCS-56	(1) Subparagraph (f)(4)(-a) corrected by errata (13-130) (2) Subparagraph (g) added (07-563)
170	Table UCS-56-4	General Notes revised (07-563)
175	Table UCS-56-11	General Notes revised (07-563)
176	UCS-66	Subparagraph (a) revised (11-1244)
177	Figure UCS-66	(1) Revised (11-1244) (2) In Note (3), SA-533 Grade E added (12-482) (3) In Notes (2)(a) and (4), Grades for SA/EN 10028-2 corrected by errata (11-1680)
180	Figure UCS-66M	(1) Revised (11-1244) (2) In Note (3), SA-533 Grade E added (12-482) (3) In Notes (2)(a) and (4), Grades for SA/EN 10028-2 corrected by errata (11-1680)

<i>Page</i>	<i>Location</i>	<i>Change (Record Number)</i>
185	Figure UCS-66.1	Cross-references in Figure nomenclature revised (11-1245)
186	Figure UCS-66.1M	Cross-references in Figure nomenclature revised (11-1245)
191	UCS-68	Subparagraph (c) revised (01-193, 09-1229)
192	UCS-79	(1) Title and subparas. (d) and (d)(5) revised (09-819) (2) Subparagraphs (e) and (f) added (09-819)
193	Table UCS-79-1	Added (09-819)
194	UCS-160	In-text Note added following subpara. (b) (12-974)
198	Table UNF-23.3	Revised (08-1609)
199	UNF-28	Revised (12-904)
199	UNF-33	Last sentence deleted (12-904)
199	Table UNF-23.4	(1) Revised (08-1609) (2) Entry for SB-367 inserted by errata (11-1513)
199	UNF-56(e)	Subparagraph (1) revised (06-788)
201	UNF-79	Subparagraph (a)(2) revised (12-237)
202	Table UNF-79	Entry for UNS N06230 added (09-1440)
206	UHA-28	Revised (12-904)
206	UHA-29	Last sentence deleted (12-904)
206	UHA-31	Last sentence deleted (12-904)
207	Table UHA-23	Revised (03-1421, 07-695, 08-1609, 11-678)
209	Table UHA-32-1	(1) Cross-reference for “Minimum Holding Time at Normal Temperature for Nominal Thickness” corrected by errata (11-2242) (2) General Note (a) revised (12-1547)
211	Table UHA-32-4	Table in General Note revised (07-695, 11-678, 12-1306)
212	UHA-44	Subparagraph (a)(2) revised (12-237)
214	UHA-51	(1) First paragraph and subparas. (a)(1), (a)(4)(-a), (a)(4)(-b), (b), (d), and (h)(2) revised (09-1920, 10-1702, 12-83) (2) Subparagraph (a)(4)(-c) added (10-1702) (3) Subparagraph (d)(1)(-a) deleted, and subparas. (d)(1)(-b) through (d)(1)(-d) redesignated (10-1702)
215	Figure UHA-51-1	Redesignated from Figure ULT-82 (12-83)
220	UCI-28	Revised (12-904)
222	UCI-99	Revised (04-349)
225	UCL-34	Last sentence of subpara. (a) deleted (04-1628)
228	UCD-28	Revised (12-904)
230	UCD-99	Revised (04-349)
237	UHT-27	Revised (12-904)
238	Table UHT-56	Note (1) revised (04-1330)
239	UHT-79	Title and subpara. (a)(1) revised (12-237)

<i>Page</i>	<i>Location</i>	<i>Change (Record Number)</i>
240	UHT-82	Revised (04-1330)
248	Figure ULW-17.2	Sketch (a) corrected by errata (13-958)
267	ULT-28	Revised (12-904)
267	ULT-30	First line of subpara. (a) revised (12-83)
271	Table ULT-82	"Thickness, in." entries for SB-209, SB-221, and SB-241 revised (09-10)
272	Table ULT-82M	"Thickness, mm" entries for SB-209, SB-221, and SB-241 revised (09-10)
272	Figure ULT-82	Moved from Part ULT to Part UHA and redesignated as Figure UHA-51-1 (12-83)
274	UHX-4	(1) Subparagraph (b) deleted, and subsequent subparagraphs redesignated (12-532) (2) In-text Note added (12-532)
276	UHX-9	Revised (11-1186)
277	UHX-10	Revised (06-886, 09-2162, 11-1186)
284	UHX-12.3	Revised (06-886, 11-1186)
284	UHX-12.4	Revised (06-886, 12-532)
288	UHX-12.5.9	Revised (08-1524)
290	UHX-13.3	Revised (06-886, 11-1186)
295	UHX-13.4	Revised (06-886, 12-532)
297	UHX-13.5.1	Revised (06-886)
299	UHX-13.5.5	Subparagraph (a) revised (06-886)
299	UHX-13.5.7	Subparagraph (b) revised (06-886)
300	UHX-13.5.8	Revised (08-1524)
300	UHX-13.5.9	Subparagraph (a)(2) revised (06-886)
301	UHX-13.5.10	Subparagraph (a) revised (06-886)
301	UHX-13.5.11	Subparagraph (c) revised (06-886)
302	UHX-13.7.1	Second paragraph revised (06-886)
302	UHX-13.7.2	Subparagraph (b) revised (06-886)
303	UHX-13.7.3	First paragraph and subparas. (c) and (g) revised (06-886)
303	UHX-13.8.1	Subparagraph (c) revised (06-886)
303	UHX-13.8.3	Revised (06-886)
303	UHX-13.8.4	First paragraph revised, and second paragraph added (06-886)
304	Table UHX-13.8.4-1	Added (06-886)
305	UHX-13.9.3	First paragraph and subpara. (d) revised (06-886)
305	UHX-14.3	Revised (06-886, 11-1186)
308	UHX-14.4	Revised (06-886, 12-532)
310	Table UHX-14.4-1	Added (06-886)

<i>Page</i>	<i>Location</i>	<i>Change (Record Number)</i>
310	UHX-14.5.1	Revised (06-886)
312	UHX-14.5.7	Subparagraph (b) revised (06-886)
312	UHX-14.5.8	Revised (08-1524)
312	UHX-14.5.9	Subparagraph (a)(2) revised (06-886)
313	UHX-14.5.10	Revised (06-886)
314	UHX-14.6.1	Subparagraph (c) revised (06-886)
314	UHX-14.6.3	Revised (06-886)
314	UHX-14.6.4	First paragraph revised, and second paragraph added (06-886)
315	Table UHX-14.6.4-1	Added (06-886)
315	UHX-14.7.3	Subparagraph (d) revised (06-886)
317	UHX-19.2	Revised (11-754)
318	UHX-19.2.2	Revised (11-754)
318	UHX-19.3	Revised (11-754)
318	UHX-20	Revised in its entirety (12-904)
352	1-4	(1) Examples 1 and 2 in subpara. (c) deleted (12-904) (2) Subparagraph (d) deleted, and subsequent subparagraphs redesignated (12-904) (3) Endnote 90 revised (11-1898)
355	1-5	Subparagraphs (a), (c), (d), and (e) revised (10-1212)
358	Figure 1-6	Sketch (d) corrected by errata (11-1680)
360	1-7	Subparagraphs (b)(1)(-a), (b)(1)(-b), (b)(3), and (b)(5) revised (11-11)
361	1-8	Title and subparas. (b) and (c) revised (10-1212)
377	Figure 2-4	Sketch (1) editorially revised (08-1641)
392	2-12	Subparagraph (a)(1) revised (12-1282)
395	2-14	Subparagraph (d) revised (08-970)
396	3-2	(1) Definition for <i>construction</i> added (09-1148) (2) Definition for <i>Material Test Report</i> revised (11-601)
414	7-4	Subparagraph (d) revised (06-788)
420	9-5(c)	Subparagraph (5) revised (10-871)
421	Figure 9-5	Sketch (b-1) corrected by errata (12-1286)
428	10-13	Subparagraph (b)(7) revised (10-1250)
445	13-7	Subparagraphs (a)(4), (b)(4), and (c)(4) deleted (12-904)
447	13-8	(1) Equations (e)(2)(5) through (e)(2)(8) corrected by errata (12-1286) (2) In subparas. (e)(3) and (f)(3), last sentence deleted (12-904)
455	13-10	Subparagraph (d) deleted (12-904)
455	13-11	Subparagraph (e)(4) deleted (12-904)
456	13-12	Subparagraph (d) deleted (12-904)

<i>Page</i>	<i>Location</i>	<i>Change (Record Number)</i>
457	13-13	Subparagraphs (b)(4) and (c)(4) deleted (12-904)
461	13-17	Revised in its entirety (12-904)
466	Figure 14-2	Deleted (12-904)
467	14-5	Deleted (12-904)
468	Figure 14-3	Deleted (12-904)
469	Mandatory Appendix 16	Deleted (12-911)
472	17-5	Subparagraph (a)(2) revised (09-279)
494	24-4	Equation (d)(6) revised (12-1551)
498	26-2	Subparagraph (g) added (12-891, 12-1834)
498	26-3	Revised (11-755, 12-890)
499	Figure 26-1-1	(1) Redesignated from Figure 26-1 (12-1834) (2) Sketches (b) and (c) revised (11-755, 12-890)
500	Figure 26-1-2	Added (12-1834)
502	Figure 26-2	Editorially renumbered from previous Figure 26-3
502	26-4.1	Subparagraph (f) revised (11-755)
502	26-4.2	Subparagraphs (a) and (b) redesignated as 26-4.2.1 and 26-4.2.2, respectively (11-755)
503	26-6.2	Subparagraphs (b) and (c) revised (11-755, 12-1834)
504	Figure 26-3	Editorially renumbered from previous Figure 26-2
504	26-6.3.3(d)	Revised (11-755)
507	26-6.6.3.2	Subparagraph (b) revised (11-755)
508	26-7.2	Subparagraphs (b) and (c) revised (11-755, 12-1834)
508	26-7.3	Equations in 26-7.3.1, 26-7.3.2, and 26-7.3.3(b), 26-7.3.3(c), and 26-7.3.3(d) revised (11-755)
510	26-7.6.1	Equations in subparagraphs (a) and (b) revised (11-755)
510	26-7.6.3.2	Subparagraph (b) revised (11-755)
511	26-7.7	Equation revised (11-755)
511	26-8.1	Revised (12-890)
511	26-8.2	Revised in its entirety (12-890)
511	26-8.3	(1) Paragraphs 26-8.3.1 and 26-8.3.2 revised (11-755, 12-890) (2) Paragraph 26-8.3.4 added (11-755)
513	26-8.6.3.2	Subparagraph (b) revised (11-755)
515	26-10	Subparagraphs (d) and (e) added (09-1452)
516	Table 26-10-1	Added (09-1452)
517	26-12.1	Revised (12-650)
518	26-14	Revised in its entirety (12-904)
519	Figure 26-14	Added (09-1452)
525	28-2	Subparagraph (b)(6) revised (05-458)

<i>Page</i>	<i>Location</i>	<i>Change (Record Number)</i>
538	34-2	In first and second paragraphs, “1150°C” revised to “1170°C” (12-661)
542	35-7	Added (11-860)
561	Mandatory Appendix 43	Added (09-1148)
562	Mandatory Appendix 44	Added (10-2041)
581	Nonmandatory Appendix L	(1) Title revised (12-904) (2) L-1.5 through L-10 deleted (12-904) (3) L-11 added (07-225)
601	W-1	(1) Subparagraph (d) revised (11-754) (2) New subpara. (e) added, and previous subpara. (e) redesignated as subpara. (f) (11-754)
602	Form U-1	All pages revised (09-741, 10-1787)
605	Form U-1A	Front and back revised (09-741, 10-1787, 11-2101)
607	Form U-1B	Revised (10-1547, 10-1787)
608	Form U-2	All pages revised (09-741, 10-1787)
611	Form U-2A	Front and back revised (09-741, 10-1787)
613	Form U-3	Added (12-735)
615	Form U-3A	Redesignated from previous Form U-3 and revised (09-741, 12-735)
617	Form U-4	Revised (10-1787)
618	Form U-5	Added (11-754)
619	Table W-3	(1) Columns “U-1B,” “U-3,” and “U-5” added (10-1547, 11-754, 12-735) (2) Previous “U3” column redesignated as “U-3A” (12-735) (3) Reference Nos. (12), (23), (25), (26), (35), (53), (55), (62), and (63) revised (06-788, 10-1547, 10-1787, 11-754, 11-2101) (4) Reference Nos. (53) and (55) corrected by errata (11-2242) (5) Reference No. (61) deleted (10-1787) (6) Reference No. (72) added (11-754)
625	Figure W-3.1	Revised (10-1787)
627	Form UV-1	Line 2 corrected by errata (11-1676)
628	Form UD-1	Lines 2A and 2B corrected by errata (11-1676)
646	Nonmandatory Appendix DD	Item (3) corrected by errata (11-1676)
646	Figure DD-1	The term “Code symbol” corrected by errata to “Certification Mark” (11-1676)
647	EE-3	Example and subparas. (a) through (c) deleted (12-904)
652	Nonmandatory Appendix FF	The term “User” editorially revised to “user” throughout (06-788)
653	FF-7	Second paragraph corrected by errata (11-1274)
667	Nonmandatory Appendix JJ	Revised in its entirety (10-875)
678	Table KK-1	Reference No. (36) revised (11-861)

<i>Page</i>	<i>Location</i>	<i>Change (Record Number)</i>
682	MM-2	Title corrected by errata (11-1676)
683	Nonmandatory Appendix NN	Added (04-349, 06-788)

NOTE: Volume 62 of the Interpretations to Section VIII, Division 1 of the ASME Boiler and Pressure Vessel Code follows the last page of Section VIII, Division 1.

LIST OF CHANGES IN RECORD NUMBER ORDER

Record Number	Change
00-211	Revised UG-84(g)(2) and UG-84(h)(3). Added Figure UG-84.5 and Table UG-84.6 to specify the HAZ impact test specimen removal location and number of specimens required.
01-193	Modified UCS-68(c).
03-1421	Revised Table UHA-23 to incorporate Code Case 2127-3.
04-349	Revised UG-99(k) and UG-100(e) to prohibit painting of pressure-retaining welds of pressure vessels prior to pressure testing unless first completing a leak test per Section V, Article 10. Revised UCI-99 and UCD-99 to prohibit painting of pressure vessels or pressure vessel parts prior to pressure testing. Revised Table NN-6.2 to include permitting of painting or coating prior to pressure testing as a matter of agreement between the user and the Manufacturer.
04-690	Added new paragraph UW-6.
04-1330	Revised Note 1 of Table UHT-56. Added new subparagraph UHT-82(b) to give the requirement for the use of electrodes having the H4 supplemental diffusible hydrogen designator and to list the correct filler metal specifications for the various welding processes. Revised UHT-82(e)(6) to clarify essential variables regarding an increase in the diffusible hydrogen designator. Redesignated subparagraphs within UHT-82 accordingly.
04-1628	Revised UCL-34(a) and added new subparagraph UW-40(f)(5)(-h).
04-1635	Revised UW-2(a)(1)(-a) for clarity, and deleted the last sentence of UW-2(a)(2) to eliminate an apparent contradiction with UW-2(a)(3).
05-458	Added “±” before “25 amps” and “3 V” in 28-2(b)(6) to approve the following intent interpretation: “Question: Is it the intent of Section VIII Division 1, Appendix 28-2(b)(6) to limit electrical characteristic variability during fill pass welding of ±3 volts and ±25 amps?”
06-788	Added new Nonmandatory Appendix NN. Deleted endnote 4 referenced in U-2(a) and incorporated the information from this endnote in Nonmandatory Appendix NN as NN-3(a) and NN-3(b). Added reference to Nonmandatory Appendix NN in U-2(a). Added reference to Nonmandatory Appendix FF in UG-35.2(c)(1). Editorially revised UG-35.2(e); UG-136(b)(2); UNF-56(e)(1); 7-4(d); Table W-3, Reference No. (12); and FF-1, FF-2, FF-3, FF-5, FF-6, and FF-7 to promote consistency of terms relative to “user” and “designated agent.”
06-886	Changed “loading cases 1, 2, and 3” to “design loading cases” and “loading cases 4, 5, 6, and 7” to “operating loading cases” throughout Part UHX. Revised the definitions of pressure, <i>P</i> , throughout Part UHX.
07-225	Deleted the term “maximum allowable external working pressure” (MAEWP) in Section VIII-1, and added clarification that maximum allowable working pressure (MAWP) can be either an internal or external pressure. Added nameplate marking examples to Appendix L.
07-260	Revised UG-100(d).
07-563	Added new subparagraph UCS-56(g) describing capacitor discharge and electric resistance welding requirements. Revised the General Notes of Tables UCS-56-4 and UCS-56-11 to include the exemption of PWHT for electric resistance welding of thermocouple wires and to include the requirements of UCS-56(g).
07-695	Revised Tables UHA-23 and UHA-32-4 to incorporate Code Case 2245-1 allowing the use of duplex stainless steel corresponding to UNS S32760 in various product forms for temperatures up to 600°F (316°C).
08-487	Changed the phrase “direct spring loaded” to “pressure relief” in UG-131(e)(7) to cover all types of pressure relief valves, and editorially revised the word “providing” in the third sentence to “provided.”
08-488	Revised first sentence of UG-126(c).
08-970	Revised 2-14(d) to clarify that rigidity index calculations are required to be performed for both gasket seating and operating conditions.
08-1428	Deleted from UG-37(g) the specific test to be used for leak tightness testing.
08-1524	Revised UHX-12.5.9, UHX-13.5.8, and UHX-14.5.8 to have one equation for the shear calculation.
08-1609	Revised Tables UCS-23, UNF-23.3, UNF-23.4, and UHA-23 to add materials that have allowable stresses in Section II, Part D, and editorially revised some entries.

Record Number	Change
08-1641	Editorially revised Figure 2-4, sketch (1).
08-1790	Updated Table UCS-23 to remove the old Chinese material designation and replace it with the new designation.
09-10	Revised Tables ULT-82 and ULT-82M.
09-279	Modified UW-19(c), and added the following sentence to UW-19(c)(2) and 17-5(a)(2): "The representative panel shall utilize the same weld details as will be used in the final construction."
09-299	Added SA/EN 10222-2 (forgings) Grades P280GH, P305GH, 13CrMo4-5, and 11CrMo9-10 to Table UCS-23.
09-739	Added SA/CSA-G40.21 Grades 44W and 50W to Table UCS-23.
09-741	Revised Forms U-1, U-1A, U-2, U-2A, and U-3.
09-760	Added an introductory subtitle clarifying the purpose and limitations of the Foreword. Revised history paragraph to recognize the realignment of the BPV into several BPVs. Deleted the paragraph on tolerances. Made editorial changes to recognize the new committee structure. Deleted words addressing governing code editions. Deleted the paragraph concerning materials. Deleted the paragraph dealing with what the committee considers in the formulation of these rules.
09-819	Revised UCS-79 title and UCS-79(d), and added UCS-79(e), UCS-79(f), and Table UCS-79-1, all to define when post-forming heat treatment is required for Grade 91.
09-991	Revised UW-27(a)(3) to add friction stir welding (FSW) as an acceptable welding process for Division 1 construction.
09-1148	Modified U-3(a), added definition of "construction" to 3-2 of Mandatory Appendix 3, and added new Mandatory Appendix 43.
09-1229	Revised last sentence of UCS-68(c).
09-1440	Added specifications for UNS N06230 to Table UNF-79.
09-1452	Added new subparagraphs 26-10(d) and 26-10(e), Table 26-10-1, and Figure 26-14 to Mandatory Appendix 26.
09-1920	Revised UHA-51 to require that UNS S17400 materials be CVN tested.
09-2013	Added capacity units to UG-129(e) for disks certified for flow capacity instead of flow resistance.
09-2162	Added new subparagraph UHX-10(e) specifying a condition of applicability for fully assembled heat exchangers. Redesignated the previous UHX-10(e) as UHX-10(f).
10-286	Revised Table UCS-23 to show both Grades A and B for SA-299.
10-288	Revised UW-19(a)(2) to eliminate the maximum thickness limit of 1½ in. for sketches (e), (g), and (h) of Figure UW-19.1.
10-631	Added new subparagraph UG-79(d) addressing reductions of weld thickness due to forming operations.
10-871	Revised 9-5(c)(5) in Mandatory Appendix 9 to provide rules to determine the minimum dimensions for the weld sizes <i>a</i> and <i>b</i> in Figure 9-5, sketches (f-1), (f-2), and (f-3).
10-875	Revised Nonmandatory Appendix JJ in its entirety.
10-1212	Revised 1-5 and 1-8 of Mandatory Appendix 1.
10-1250	Changed "Welders Qualification Records" to "Welder / Welding Operator Performance Qualification Records" in 10-13(b)(7).
10-1547	In Form U-1B: added explanatory subscripts to lines 1 through 6; corrected Reference No. (6) to Reference No. (7) in the "Graphite components" table (line 6); added Reference No. (54); and deleted Reference letter (B). In Table W-3: inserted new column "U-1B," and changed cross-reference "UG-98" to "UG-118" in Reference No. (35).
10-1702	In UHA-51, added a cross-reference to the flowcharts of Nonmandatory Appendix JJ. Revised UHA-51(a)(1), abbreviating "HAZ." Revised UHA-51(a)(4)(-a) and UHA-51(a)(4)(-b), and added UHA-51(a)(4)(-c). Deleted UHA-51(d)(1)(-a) and cross-references to it in UHA-51(d)(1)(-b). Renumbered UHA-51(d)(1)(-b) through UHA-51(d)(1)(-d) as UHA-51(d)(1)(-a) through UHA-51(d)(1)(-c). Revised UHA-51(h)(2). Revised cross-reference to UHA-51(d)(1)(-a) in UW-2(b)(1). Deleted cross-reference to UHA-51(d)(1)(-b) in UW-2(b)(4)(-a). Revised cross-reference to UHA-51(d)(1)(-c) in UW-2(b)(4)(-b).
10-1787	Revised Forms U-1, U-1A, U-1B, U-2, U-2A, and U-4; Table W-3; and Figure W-3.1.
10-1796	Revised Figure UW-21 to clarify that the label for illustrations (1), (2), and (3) refers to the weld dimension and not the setback dimension for the location of the weld.
10-2041	Added Mandatory Appendix 44.

Record Number	Change
11-06	Added sketch (a-4) to Figure UW-16.1.
11-11	Deleted the word “internal” from 1-7(b)(3) and added the definition of <i>P</i> to 1-7(b)(5). Added SI Unit equivalents to 1-7(b)(1)(-a) and 1-7(b)(1)(-b).
11-83	Revised UG-84(f)(2).
11-253	Revised UG-11 title and UG-11(a).
11-442	Revised Figure UG-28.1, Note (1), and UG-33(f) to require the cone thickness to be the same as the adjacent cylindrical shell thickness when the junction is not a line of support.
11-471	Revised the SI Units table in UW-35(d) per the guidelines in Nonmandatory Appendix GG.
11-475	Revised UW-34.
11-601	Revised definition of “Material Test Report” in Mandatory Appendix 3.
11-678	Added UNS S32202 to Tables UHA-23 and UHA-32-4.
11-733	Errata correction. See Summary of Changes for details.
11-754	Added character requirements for supplemental heat exchanger markings to UHX-19.2, and added the requirement in UHX-19.3 that the pertinent fixed-tubesheet heat-exchanger operating data be indicated on new Manufacturer’s Data Report Form U-5.
11-755	Revised Mandatory Appendix 26 to bring it into alignment with EJMA, 9th Edition except coefficients taking into account the initial rotation of the bellows, and to incorporate Code Case 2587.
11-860	Added new paragraph 35-7 to Mandatory Appendix 35 to incorporate Code Case 2369.
11-861	Revised UG-118, and Table KK-1, Reference No. (36) to allow marking by electrochemical etching.
11-877	Deleted SA-695 from Table UCS-23.
11-987	Revised UG-11(a) to require the vessel Manufacturer be responsible for ensuring that post-forming heat treatment is conducted as required for parts that are supplied in a preformed condition by another organization.
11-1186	Added rules to UHX-9 for tubesheet edge extensions that are not extended for bolting. Added rules to UHX-10, UHX-12, UHX-13, and UHX-14 for modifying the tubesheet diameter of tubesheets having an edge thickness that is relatively thin compared to the center thickness.
11-1240	Revised Table U-3 to update “year of acceptable edition” for those standards that were reviewed. Editorially revised titles, and deleted and added standards as needed.
11-1244	Revised UCS-66(a) and Figures UCS-66 and UCS-66M to apply consistent terminology for “governing thickness.”
11-1245	Revised the nomenclature in Figures UCS 66.1 and UCS-66.1M to refer to Notes (2) and (3) of Figure UCS-66.2 rather than to General Notes (b) and (c).
11-1274	Errata correction. See Summary of Changes for details.
11-1398	Revised UG-117(a) to clarify that when oversight is provided by a Certified Individual in accordance with provisions of the Code, the qualification and duties for the Certified Individual shall meet the current requirements of ASME QAI-1.
11-1513	Errata correction. See Summary of Changes for details.
11-1558	Revised UW-51(a)(4) to allow for weld examinations of material $\frac{1}{4}$ in. (6 mm) and greater in thickness.
11-1676	Errata correction. See Summary of Changes for details.
11-1680	Errata correction. See Summary of Changes for details.
11-1898	Changed UG-32(e) conversion of 70,000 psi to 485 MPa from 500 MPa, and 20,000 psi to 138 MPa from 150 MPa using formula.
11-2101	Revised Form U-1A, line 5 to be consistent with all the other forms. Revised Table W-3 as follows: in Reference No. (23), added a joint type of W for autogenously welded pipe and tube; in Reference No. (25), added Types 7 and 8; and in Reference No. (26), added an explanation for the joint efficiency for the circumferential joint(s) of the shell.
11-2183	Added the word “machine” to UG-84(i)(3)(-a)(-1).
11-2185	Revised UG-20(f)(2) to allow pneumatic testing of pressure vessels that apply the UG-20(f) impact test exemption.
11-2242	Errata correction. See Summary of Changes for details.
12-83	Corrected cross-reference in ULT-30(a). Redesignated Figure ULT-82 as Figure UHA-51-1, and corrected the cross-reference to this figure in UHA-51(a)(4)(-a)(-1).

Record Number	Change
12-237	Added new Table UG-79-1, replacing the equations for forming strain and maximum fiber elongation strain in UNF-79(a)(2), UHA-44(a)(2), and UHT-79(a)(1).
12-370	Revised UG-11(c)(5) to provide an exemption to the requirement for a Material Test Report for ASME product standard parts, with an accompanying Intent Interpretation.
12-401	Revised UG-129(a), UG-129(a)(7), UG-129(d), and UG-129(e) to require secure attachment of nameplate, and added the word “metal” before “plate or plates.” In UG-129(a)(7), revised cross-reference regarding adhesive attachment, from “UG-119” to “Appendix 18,” and changed the word “tag” to “plate.” Revised UG-129(a)(7), UG-129(e)(10), and UG-129(f)(9) to specify the location of the Certification Mark designator; added an alternate method of applying the Certification Mark; and added a reference to acceptance by an ASME Designated organization.
12-403	Added a phrase to the second sentence of UG-140(b)(2) that includes the requirements of UG-125 through UG-138.
12-482	Added SA-533, Type E Cl. 1 and 2 to Table UCS-23 and Figures UCS-66 and UCS-66M.
12-526	Deleted the phrase “except as covered in U-1(f)” from the beginning of U-1(c)(2)(-d).
12-532	Deleted mandatory subparagraphs UHX-4(b), UHX-12.4(c), UHX-13.4(d), and UHX-14.4(e); redesignated subsequent subparagraphs accordingly; and added a cautionary Note to UHX-4.
12-650	In Mandatory Appendix 26, 26-12.1, corrected equations giving maximum allowable test pressure vs. instability.
12-661	Revised Celsius temperatures in Mandatory Appendix 34.
12-735	Added new Form U-3 (similar to Form U-1) for UM multichamber vessels. Redesignated former Form U-3 as Form U-3A to be used for single chamber vessels, and revised Table W-3 to reflect the new form. Revised UG-117 and UG-120 to cover both Forms U-3 and U-3A.
12-749	Changed the existing Section III, Division 1 Appendices to Section III Appendices.
12-890	Added new rules on minimum shell length for internally attached bellows to 26-3, and added new rules for internally attached bellows and for reinforcing collars to 26-8.
12-891	Added new requirement on minimum length of shell on each side of the bellows to 26-2.
12-904	Added paragraph UG-16(f). Removed numerical example problems from various sections. Deleted the numerical examples in Nonmandatory Appendix L and revised its title.
12-911	Deleted Mandatory Appendix 16.
12-974	Added a Note to UCS-160, following UCS-160(b).
12-1132	Revised UG-125(a) for clarity.
12-1282	Changed the dimension g_1 given in 2-12 as follows: “The minimum dimension g_1 must be the lesser of $2t$ (t from UG-27) or $4r$, but in no case less than $\frac{1}{2}$ in. (13 mm).”
12-1286	Errata correction. See Summary of Changes for details.
12-1306	Revised the heat treatment temperatures for P-No 10H Gr. 1 materials given in the General Note of Table UHA-32-4.
12-1547	Revised Table UHA-32-1, General Note (a) for greater consistency with UW-40(f).
12-1551	Editorially corrected S_a in equation 24-4(d)(6) to S_a (subscript a).
12-1641	Deleted the phrase “—Mandatory” from “Submittal of Technical Inquiries to the Boiler and Pressure Vessel Committee—Mandatory” in the front matter.
12-1736	Errata correction. See Summary of Changes for details.
12-1834	Added new Figure 26-1-2 showing the starting points for the measurement of the length of shell on each side of bellows, and showing the convolution pitch for U-shaped bellows no longer measured after the sidewalls of the convolution have been made parallel.
12-2051	Added new subparagraph UG-6(c) to address the use of certain forgings for tubesheets and pressure vessel shells.
13-130	Errata correction. See Summary of Changes for details.
13-958	Errata correction. See Summary of Changes for details.

(13) **CROSS-REFERENCING AND STYLISTIC CHANGES IN THE BOILER AND PRESSURE VESSEL CODE**

There have been structural and stylistic changes to BPVC, starting with the 2011 Addenda, that should be noted to aid navigating the contents. The following is an overview of the changes:

Subparagraph Breakdowns/Nested Lists Hierarchy

- First-level breakdowns are designated as (a), (b), (c), etc., as in the past.
- Second-level breakdowns are designated as (1), (2), (3), etc., as in the past.
- Third-level breakdowns are now designated as (-a), (-b), (-c), etc.
- Fourth-level breakdowns are now designated as (-1), (-2), (-3), etc.
- Fifth-level breakdowns are now designated as (+a), (+b), (+c), etc.
- Sixth-level breakdowns are now designated as (+1), (+2), etc.

Footnotes

With the exception of those included in the front matter (roman-numbered pages), all footnotes are treated as endnotes. The endnotes are referenced in numeric order and appear at the end of each BPVC section/subsection.

Submittal of Technical Inquiries to the Boiler and Pressure Vessel Standards Committees

Submittal of Technical Inquiries to the Boiler and Pressure Vessel Standards Committees has been moved to the front matter. This information now appears in all Boiler Code Sections (except for Code Case books).

Cross-References

It is our intention to establish cross-reference link functionality in the current edition and moving forward. To facilitate this, cross-reference style has changed. Cross-references within a subsection or subarticle will not include the designator/identifier of that subsection/subarticle. Examples follow:

- *(Sub-)Paragraph Cross-References.* The cross-references to subparagraph breakdowns will follow the hierarchy of the designators under which the breakdown appears.
 - If subparagraph (-a) appears in X.1(c)(1) and is referenced in X.1(c)(1), it will be referenced as (-a).
 - If subparagraph (-a) appears in X.1(c)(1) but is referenced in X.1(c)(2), it will be referenced as (1)(-a).
 - If subparagraph (-a) appears in X.1(c)(1) but is referenced in X.1(e)(1), it will be referenced as (c)(1)(-a).
 - If subparagraph (-a) appears in X.1(c)(1) but is referenced in X.2(c)(2), it will be referenced as X.1(c)(1)(-a).
- *Equation Cross-References.* The cross-references to equations will follow the same logic. For example, if eq. (1) appears in X.1(a)(1) but is referenced in X.1(b), it will be referenced as eq. (a)(1)(1). If eq. (1) appears in X.1(a)(1) but is referenced in a different subsection/subarticle/paragraph, it will be referenced as eq. X.1(a)(1)(1).