K345.2.3 Special Provisions for Leak Testing. Paragraphs K345.2.3(a), (b), and (c) below apply only to the leak test specified in para. K345.1(a). They are not applicable to the installed piping system leak test specified in para. K345.1(b).

(a) Piping Components and Subassemblies. Piping components and subassemblies may be leak tested either separately or as assembled piping.

(b) Flanged Joints. Flanged joints used to connect piping components that have previously been leak tested, and flanged joints at which a blank or blind flange is used to isolate equipment or other piping during the leak test, need not be leak tested.

(c) Closure Welds. Leak testing of the final weld connecting piping systems or components that have been successfully leak tested is not required, provided the weld is examined in-process in accordance with para. 344.7 and passes the required 100% radiographic examination in accordance with para. K341.4.2.

K345.3 Preparation for Leak Test

Paragraph 345.3 applies in its entirety.

K345.4 Hydrostatic Leak Test

Paragraph 345.4.1 applies. See paras. K345.4.2 and K345.4.3 below.

K345.4.2 Test Pressure for Components and Welds. Except as provided in para. K345.4.3, the hydrostatic test pressure at every point in a metallic piping system shall be as follows:

(a) not less than 1.25 times the design pressure.

(b) when the design temperature is greater than the test temperature, the minimum test pressure, at the point under consideration, shall be calculated by eq. (38)

$$P_T = 1.25PS_T/S \quad (38)$$

where

P = internal design gage pressure
P_T = minimum test gage pressure
S = allowable stress at component design temperature for the prevalent pipe material; see Appendix K, Table K-1
S_T = allowable stress at test temperature for the prevalent pipe material; see Table K-1

(c) in those cases where the piping system may not include pipe itself, any other component in the piping system, other than pipe-supporting elements and bolting, may be used to determine the S_T/S ratio based on the applicable allowable stresses obtained from Table K-1. In those cases where the piping system may be made up of equivalent lengths of more than one material, the S_T/S ratio shall be based on the minimum calculated ratio of the included materials.

K345.4.3 Hydrostatic Test of Piping With Vessels as a System. Paragraph 345.4.3(a) applies.

K345.5 Pneumatic Leak Test

Paragraph 345.5 applies, except for para. 345.5.4. See para. K345.5.4 below.

K345.5.4 Test Pressure. The pneumatic test pressure for components and welds shall be identical to that required for the hydrostatic test in accordance with para. K345.4.2.

K345.6 Hydrostatic–Pneumatic Leak Test for Components and Welds

If a combination hydrostatic–pneumatic leak test is used, the requirements of para. K345.5 shall be met, and the pressure in the liquid-filled part of the piping shall not exceed the limits stated in para. K345.4.2.

K346 RECORDS

K346.1 Responsibility

It is the responsibility of the piping designer, the manufacturer, the fabricator, and the erector, as applicable, to prepare the records required by this Chapter and by the engineering design.

K346.2 Required Records (18)

At least the following records, as applicable, shall be provided to the owner or the Inspector by the person responsible for their preparation:

(a) the engineering design

(b) material certifications

(c) procedures used for fabrication, welding, heat treatment, examination, and testing

(d) repair records of materials and piping components, including the welding procedure used for each, and location of repairs

(e) performance qualifications for welders and welding operators

(f) qualifications of examination personnel

(g) records of examination of pipe and tubing for longitudinal defects as specified in paras. K344.6.2(c) and K344.8.3, as applicable

K346.3 Retention of Records

The owner shall retain one set of the required records for at least 5 years after they are received.

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Chapter X
High Purity Piping

U300 GENERAL STATEMENTS

(a) Chapter X pertains to piping designated by the owner as being in High Purity Fluid Service. See also Appendix M.

(b) The organization, content, and paragraph designations of this Chapter correspond to those of the base Code (Chapters I through VI), Chapter VII, and Chapter VIII. The prefix U is used to designate Chapter X requirements.

(c) Provisions and requirements of the base Code, Chapter VII, and Chapter VIII apply only as stated in this Chapter.

(d) For piping not in High Purity Fluid Service, Code requirements are found in Chapters I through IX.

(e) High Purity Piping. Chapter X provides alternative rules for design and construction of piping designated by the owner as being High Purity Fluid Service.

(1) These rules apply only when specified by the owner, and only as a whole, not in part.

(2) Chapter X rules do not provide for High Pressure Fluid Service.

(3) Chapter VII applies to nonmetallic piping and piping lined with nonmetals in High Purity Fluid Service.

(f) Chapter I applies.

PART 1
CONDITIONS AND CRITERIA

Chapter II, Part 1 applies. See para. U301.3.2(b)(5).

U301 DESIGN CONDITIONS

U301.3 Design Temperature

U301.3.2 Uninsulated Components

(b)

(5) compression, face seal, and hygienic clamped fittings and joints — 100% of the fluid temperature

PART 2
PRESSURE DESIGN OF PIPING COMPONENTS

Chapter II, Part 2 applies. See Figure U304.5.3 for representative configuration for metal face seal blanks.

PART 3
FLUID SERVICE REQUIREMENTS FOR PIPING COMPONENTS

Chapter II, Part 3 applies. See paras. U306.6, U307.3, and U308.

U306 FITTINGS, BENDS, MITERS, LAPS, AND BRANCH CONNECTIONS

U306.6 Tube Fittings

(a) Tube fittings not listed in Table 326.1 or Appendix A shall meet the pressure design requirements described in para. 302.2.3 and the mechanical strength requirements described in para. 303.

(b) Compression-type tube fittings may be used in accordance with para. U315.2 provided that the type of fitting selected complies with the following:

(1) The gripping action of the fitting shall provide vibration resistance as demonstrated by exhibiting a stress intensity factor equal to or less than 1.5.

(2) Intermixing of components from different manufacturers is permitted only when specified in the engineering design.

(c) Face seal or hygienic clamp-type fittings in which the tightness of the joint is provided by a seating surface other than the threads (e.g., a metal face-seal fitting comprising internal and external threaded components, glands, and gasket or other constructions shown typically in Figure U335.7.1) may be used.

U307 VALVES AND SPECIALTY COMPONENTS

U307.3 High Purity Fluid Service Valves

Valves such as ball, bellows, and diaphragm valves designed for High Purity Fluid Service that are not listed in Table 326.1 shall meet the pressure design requirements described in para. 302.2.2 and the mechanical strength requirements described in para. 303.

U308 FLANGES, BLANKS, FLANGE FACINGS, AND GASKETS

Flanges should be avoided whenever possible. When flanges are utilized, para. 308 applies, except expanded joint flanges described in para. 308.2.2 are not permitted.

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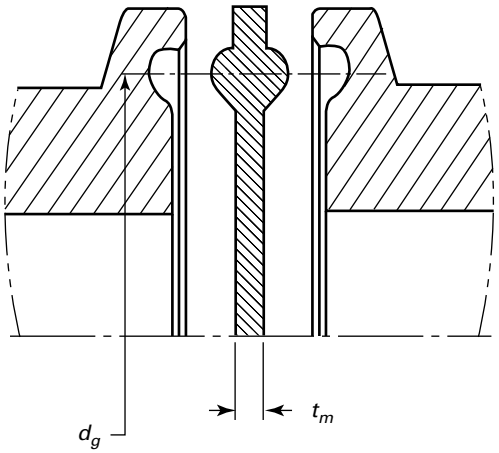
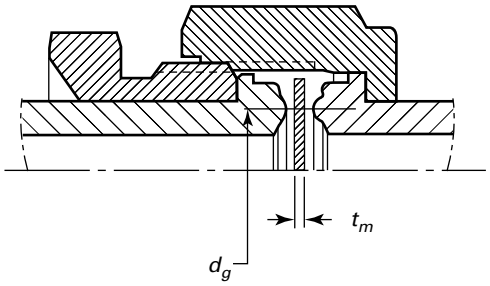
Figure U304.5.3 Blanks



(a) Hygienic Clamp-Type Fitting



(b) Metal Face Seal

PART 4
FLUID SERVICE REQUIREMENTS FOR PIPING JOINTS

Chapter II, Part 4 applies, except expanded joints, flared tube fittings, and caulked joints, described in paras. 313, 315, and 316, respectively, are not permitted. See paras. U311, U311.1(c), U314, and U315.

U311 WELDED JOINTS

Paragraph 311 applies, except for para. 311.1(c). See para. U311.1(c).

U311.1 General

(c) Examination shall be in accordance with para. U341.4.1.

U314 THREADED JOINTS

Threaded joints should be avoided whenever possible. When threaded joints are utilized, para. 314 applies.

U315 TUBING JOINTS

Paragraph 315 applies. See paras. U315.1, U315.2(c), and U315.3.

U315.1 General

In selecting and applying compression, face seal, and hygienic clamp-type tube fittings, the designer shall consider the possible adverse effects on the joints of such factors as assembly and disassembly, cyclic loading, vibration, shock, and thermal expansion and contraction. See para. FU315.

U315.2 Joints Conforming to Listed Standards

(c) Joints using compression, face seal, hygienic clamp, and automatic welding tube fittings covered by listed standards may be used.

U315.3 Joints Not Conforming to Listed Standards

(a) Compression-type tube fitting joints shall be fully gageable on initial installation to ensure sufficient tightening.

(b) Safeguarding is required for face seal or hygienic clamp-type joints used under severe cyclic conditions.

PART 5
FLEXIBILITY AND SUPPORT

Chapter II, Part 5 applies. See para. U319.3.6.

U319 PIPING FLEXIBILITY

U319.3 Properties for Flexibility Analysis

U319.3.6 Flexibility and Stress Intensification Factors. Paragraph 319.3.6 applies; however, piping components used in high-purity applications, e.g., multiport block valves, hygienic unions, crosses, and point-of-use and adaptor fittings, often do not have geometries similar to those in Table D300.

PART 6
SYSTEMS

Chapter II, Part 6 applies.

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PART 7
METALLIC MATERIALS

The provisions and requirements in Chapter III for materials apply. Materials commonly used in high purity process piping systems include austenitic, ferritic, and duplex stainless steels, and nickel and nickel alloys.

PART 8
STANDARDS FOR PIPING COMPONENTS

Chapter IV applies.

PART 9
FABRICATION, ASSEMBLY, AND ERECTION

U327 GENERAL

Metallic piping materials and components are prepared for assembly and erection by one or more of the fabrication processes covered in paras. U328, U330, U331, and U332. When any of these processes is used in assembly or erection, requirements are the same as for fabrication.

U328 WELDING

Paragraph 328 applies, except for paras. 328.3.2, 328.5.4, and 328.5.5. See paras. U328.2.1(g) and (h), U328.4, U328.4.4, and U328.5.1(g) for additional requirements.

U328.2 Welding and Brazing Qualification

U328.2.1 Qualification Requirements

(g) A change in the type or nominal composition of the backing (purge) gas shall require requalification.

(h) The welding process shall be orbital GTAW, except for tack welds. Tack welds made prior to orbital welding may be manual GTAW.

(18) ### U328.4 Preparation for Welding

Paragraph 328.4.1 applies. Additionally, when weld coupon examination is specified in the engineering design or in the referencing code or standard (e.g., ASME BPE or SEMI), primary weld coupons shall be made in accordance with para. U328.4.4(b)(1) and examined in accordance with para. U344.8 prior to the start of production welding. This will demonstrate that the orbital welding equipment is set up properly and the weld program is sufficient to make repeatable production welds in accordance with the qualified welding procedure specification (WPS).

U328.4.4 Preparation of Weld Coupons

(a) Weld coupons shall be made by qualified welding operators using the same qualified WPS and the same variables used for production welds.

(b) Methods

(1) Primary weld coupons shall be made from two short sections of tubing selected from the same diameter, wall thickness, and alloy as the material used for production. Sections shall be of sufficient length for fit up in the weld head allowing for attachment of inside diameter purge apparatus outside of the weld head. The sections shall be welded together in a square groove weld on a butt joint.

(2) Production weld coupons may be made in accordance with para. U328.4.4(b)(1) or, at the owner's discretion, may be cut from actual production welds. The weld coupons shall be selected to ensure that the work product of each welding operator doing the production welding is represented.

U328.5 Welding Requirements

U328.5.1 General

(g) Tack welds shall be fully consumed after completion of the weld. Tack welds shall be made by a qualified welder or welding operator.

U330 PREHEATING

Paragraph 330 applies.

U331 HEAT TREATMENT

Paragraph 331 applies.

U332 BENDING AND FORMING

Paragraph 332 applies in its entirety.

U333 BRAZING AND SOLDERING

Brazing and soldering are not permitted.

U335 ASSEMBLY AND ERECTION

Paragraph 335 applies, except for paras. 335.4.1, 335.5, and 335.6. See paras. U335.7 and U335.8.

U335.7 Face Seal Joints

U335.7.1 Metal Face Seal. Metal face seal joints shall be installed and assembled in accordance with manufacturer's instructions. See Figure U335.7.1, illustration (a).

U335.7.2 Nonmetallic Face Seal. Nonmetallic face seal joints shall be installed and assembled in accordance with manufacturer's instructions. Care shall be taken to avoid distorting the seal when incorporating such joints into

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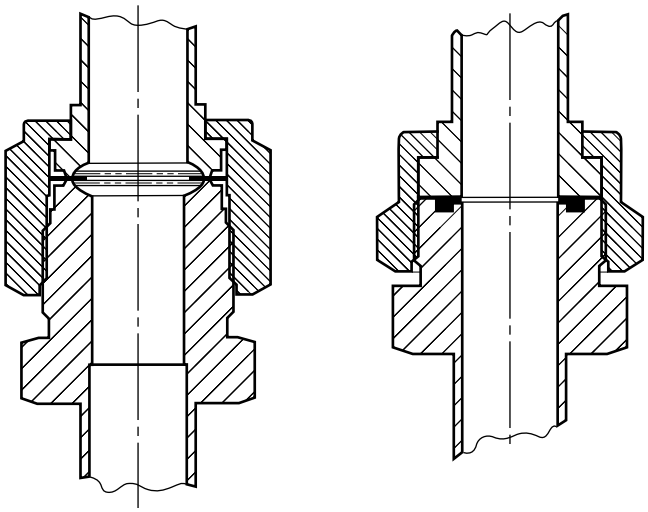
Figure U335.7.1 Face Seal Joints



(a) Metal Face Seal

(b) Nonmetallic Face Seal

piping assemblies by welding. See Figure U335.7.1, illustration (b).

U335.8 Hygienic Clamp Joint Assembly

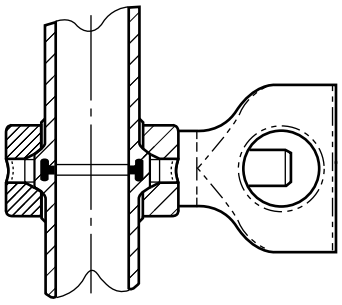
Hygienic clamp joint assembly components, e.g., those shown in Figures U335.8A, U335.8B, and U335.8C, shall be installed and assembled in accordance with the manufacturer's instructions. Care shall be taken to avoid distorting the seal when incorporating such joints into piping assemblies by welding.

PART 10
INSPECTION, EXAMINATION, AND TESTING

U340 INSPECTION

Paragraph 340 applies in its entirety.

Figure U335.8A Hygienic Clamp Joint Assembly



U341 EXAMINATION

Paragraph 341 applies. See paras. U341.3.2 and U341.4.1.

U341.3 Examination Requirements

U341.3.2 Acceptance Criteria. Acceptance criteria for all coupon and production welds shall be as stated in the engineering design or in the referencing code or standard (e.g., ASME BPE or SEMI) and shall at least meet the applicable requirements in para. 341.3.2. (18)

U341.4 Extent of Required Examination

U341.4.1 Examination. A weld coupon examination in accordance with para. U344.8 may be used in lieu of the 5% random radiography/ultrasonic examination required in para. 341.4.1(b)(1) when the following are employed in fabrication:

(a) autogenous automatic orbital welding

(b) automatic orbital welding with the use of consumable insert rings

U341.4.5 Weld Coupon Examination. Weld coupons shall be made and examined in accordance with para. U344.8 when any of the following conditions exist:

(a) beginning of shift

(b) change of purge source

(c) change of power supply

(d) change of equipment, e.g., weld head, weld-head extensions, tungsten

(e) any time there is a weld defect

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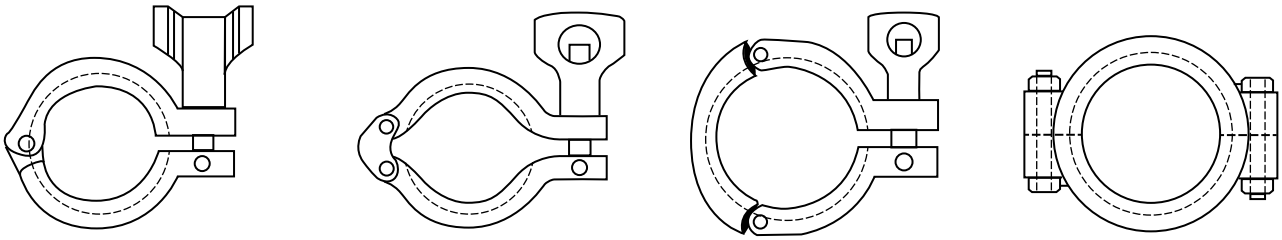
Figure U335.8B Hygienic Clamp Types



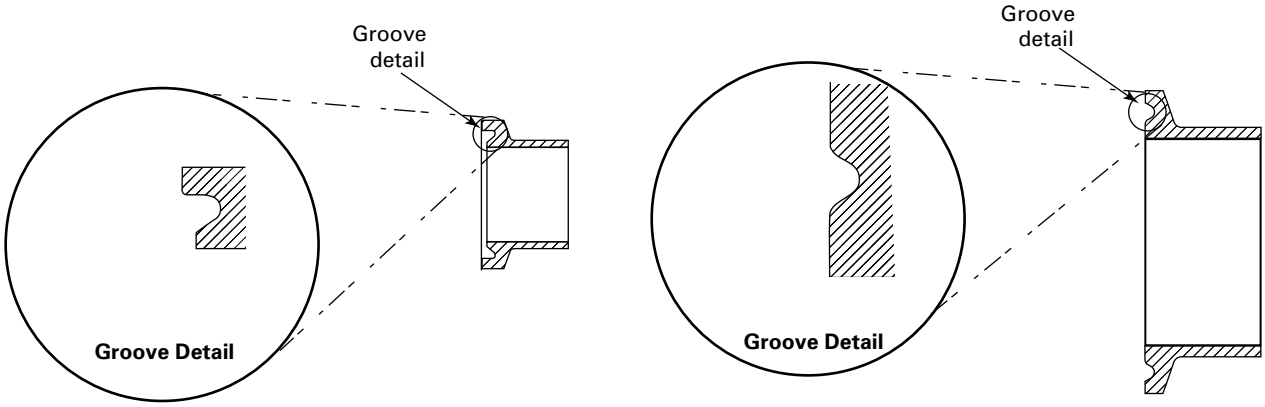
(1) Two-Piece Single Pin With Wing Nut

(2) Two-Piece Double Pin With Wing Nut

(3) Three-Piece Double Pin With Wing Nut

(4) Two-Bolt Heavy Duty

Figure U335.8C Hygienic Ferrules



(1) Type A: O.D. Tube Sizes 1/4 in. Through 1 in.

(2) Type B: O.D. Tube Sizes 1 in. and Above

U342 EXAMINATION PERSONNEL

Paragraph 342 applies in its entirety. See para. U342.2(a).

U342.2 Specific Requirement

(a) For weld coupon examination

(1) the examinations shall be performed by personnel other than those performing the production work or

(2) with the owner's approval, the personnel performing the production work shall be permitted to perform the examination, provided the personnel meet the personnel qualification and certification requirements in para. 342.1

U343 EXAMINATION PROCEDURES

Paragraph 343 applies.

U344 TYPES OF EXAMINATION

Paragraph 344 applies. See paras. U344.2 and U344.8.

U344.2 Visual Examination

Paragraph 344.2 applies, except that in addition to the method described in para. 344.2.2, borescopic examination shall be acceptable.

U344.8 Weld Coupon Examination

U344.8.1 Requirements. Weld coupon examination comprises examination of weld coupons for the following, as applicable:

(a) prior to welding of coupons made in accordance with para. U328.4.4(b)(1)

(1) joint preparation and cleanliness

(2) fit-up, collet or clamp grip, and alignment in the weld head

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(3) variables in the orbital welding machine specified in the WPS

(b) after welding of coupons made in accordance with para. U328.4.4(b)(1), and for weld coupons made in accordance with para. U328.4.4(b)(2), for compliance with para. U341.3.2

(1) alignment

(2) weld penetration

(3) weld bead width variation

(4) weld bead meander

(5) discoloration

(6) weld defects, e.g., cracks, porosity, or sulfur stringers

To allow direct visual examination of the inside surfaces, the weld coupon may be cut or a suitable indirect visual examination method (e.g., borescopic examination) may be used.

U344.8.2 Method. A weld coupon shall be made to allow visual examination in accordance with para. U344.2, unless otherwise specified in the engineering design.

U345 TESTING

Paragraph 345 applies except for paras. 345.1, 345.8, and 345.9. See paras. U345.1, U345.8, and U345.9.

U345.1 Required Leak Test

Paragraph 345.1 applies, except that, at the owner's option, a helium mass spectrometer test in accordance with para. U345.8.1 may be substituted for the hydrostatic leak test.

U345.8 Sensitive Leak Test

Paragraph 345.8 applies, except that the helium mass spectrometer test described in para. U345.8.1 is also an acceptable method.

U345.8.1 Helium Mass Spectrometer Test. The test shall be one of the following methods and performed in accordance with the following:

(a) For pressurized systems, the test shall be in accordance with ASME BPVC, Section V, Article 10, Appendix IV (Helium Mass Spectrometer — Detector Probe Technique).

(1) The test pressure shall be the lesser of 105 kPa (15 psig) gage or 25% of the design pressure.

(2) Prior to testing, the test pressure shall be held a minimum of 30 min.

(3) Unless otherwise specified in the engineering design, the system tested is acceptable when no leakage is detected that exceeds the allowable leakage rate of 1×10^{-4} std cc/s.

(b) For evacuated systems, the test shall be in accordance with ASME BPVC, Section V, Article 10, Appendix V (Helium Mass Spectrometer Test — Tracer Probe Technique).

(1) The piping system shall be evacuated to an absolute pressure sufficient for connection of the helium mass spectrometer to the system.

(2) Unless otherwise specified in the engineering design, the system tested is acceptable when no leakage is detected that exceeds the allowable leakage rate of 1×10^{-5} std cc/s.

U345.9 Alternative Leak Test

Paragraph 345.9 applies, except that welds may be examined by weld coupon examination method in accordance with para. U341.4.5 and the test method may be helium mass spectrometer test in accordance with para. U345.8.1.

U346 RECORDS

U346.2 Responsibility

It is the responsibility of the piping designer, the manufacturer, the fabricator, and the erector, as applicable, to prepare the records required by this Code, ASME BPE, SEMI, or other industry standard as specified in the engineering design.

U346.3 Retention of Records

Paragraph 346.3 applies.

PART 11
HIGH PURITY PIPING IN CATEGORY M FLUID SERVICE

UM300 GENERAL STATEMENTS

(a) Chapter X, Part 11 pertains to piping designated by the owner as being high purity piping in Category M Fluid Service. See also Appendix M.

(b) The organization, content, and paragraph designations of these Parts correspond to those of Chapter VIII. The prefix UM is used.

(c) Paragraphs M300(d), (e), and (f) apply.

(d) Provisions and requirements of Chapter VIII apply with the additional requirements in paras. UM307, UM307.2, UM322, UM322.3, UM328, UM335, UM335.3.3, UM341, UM341.4(b)(1) and (2), and UM345(b).

UM307 METALLIC VALVES AND SPECIALTY COMPONENTS

Paragraph M307 applies in its entirety. See also para. UM307.2(a).

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UM307.2 Specific Requirements

(a) For bellows or diaphragm sealed type valves, the bonnet or cover plate closure shall be secured by a straight thread sufficient for mechanical strength, have a metal-to-metal seat, and include a secondary stem seal.

UM322 SPECIFIC PIPING SYSTEMS

Paragraph M322 applies, except for para. M322.3(c). See para. UM322.3(c).

UM322.3 Instrument Piping

(c) joining methods shall conform to the requirements of para. U315

UM328 WELDING OF MATERIALS

Welding shall be in accordance with paras. M311.1 and U328, except examination shall be in accordance with para. UM341.

UM335 ASSEMBLY AND ERECTION OF METALLIC PIPING

Paragraph M335 applies, except for para. M335.3.3. See para. UM335.3.3.

UM335.3.3 Straight-Threaded Joints. The requirements of para. M335.3.3 are subject to the limitations in para. UM322.

UM341 EXAMINATION

Paragraph M341 applies. See UM341.4(b)(1) and (2).

UM341.4 Extent of Required Examination

(b) Other Examination

(1) The 100% radiography/ultrasonic examination required in para. M341.4(b) applies.

(2) The in-process examination alternative permitted in para. 341.4.1(b)(1) applies, except a weld coupon examination in accordance with para. U344.8 is also an acceptable substitute when specified in the engineering design or by the Inspector.

UM345 TESTING

Paragraph M345(a) applies. See para. UM345(b).

(b) A sensitive leak test in accordance with para. U345.8 shall be included in the required leak test (para. U345.1).

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APPENDIX A
ALLOWABLE STRESSES AND QUALITY FACTORS FOR METALLIC PIPING AND BOLTING MATERIALS

Begins on the next page.

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(18)

Specification Index for Appendix A

Spec. No.	Title
ASTM	
A36	Carbon Structural Steel
A47	Ferritic Malleable Iron Castings
A48	Gray Iron Castings
A53	Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
A105	Carbon Steel Forgings for Piping Applications
A106	Seamless Carbon Steel Pipe for High-Temperature Service
A126	Gray Iron Castings for Valves, Flanges, and Pipe Fittings
A134	Pipe, Steel, Electric-Fusion (Arc)-Welded (Sizes NPS 16 and Over)
A135	Electric-Resistance-Welded Steel Pipe
A139	Electric-Fusion (Arc)-Welded Steel Pipe (NPS 4 and Over)
A179	Seamless Cold-Drawn Low-Carbon Steel Heat-Exchanger and Condenser Tubes
A181	Carbon Steel Forgings, for General-Purpose Piping
A182	Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service
A193	Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications
A194	Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both
A197	Cupola Malleable Iron
A203	Pressure Vessel Plates, Alloy Steel, Nickel
A204	Pressure Vessel Plates, Alloy Steel, Molybdenum
A213	Seamless Ferritic and Austenitic Alloy-Steel Boiler, Superheater, and Heat-Exchanger Tubes
A216	Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service
A217	Steel Castings, Martensitic Stainless and Alloy, for Pressure-Containing Parts, Suitable for High-Temperature Service
A234	Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service
A240	Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
A268	Seamless and Welded Ferritic and Martensitic Stainless Steel Tubing for General Service
A269	Seamless and Welded Austenitic Stainless Steel Tubing for General Service
A270	Seamless and Welded Austenitic and Ferritic/Austenitic Stainless Steel Sanitary Tubing
A276	Stainless Steel Bars and Shapes
A278	Gray Iron Castings for Pressure-Containing Parts for Temperatures Up to 650°F (350°C)
A283	Low and Intermediate Tensile Strength Carbon Steel Plates

Spec. No.	Title
ASTM (Cont'd)	
A285	Pressure Vessel Plates, Carbon Steel, Low- and Intermediate-Tensile Strength
A299	Pressure Vessel Plates, Carbon Steel, Manganese-Silicon
A302	Pressure Vessel Plates, Alloy Steel, Manganese-Molybdenum and Manganese-Molybdenum-Nickel
A307	Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
A312	Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes
A320	Alloy-Steel and Stainless Steel Bolting for Low-Temperature Service
A333	Seamless and Welded Steel Pipe for Low-Temperature Service and Other Applications with Required Notch Toughness
A334	Seamless and Welded Carbon and Alloy-Steel Tubes for Low-Temperature Service
A335	Seamless Ferritic Alloy-Steel Pipe for High-Temperature Service
A350	Carbon and Low-Alloy Steel Forgings, Requiring Notch Toughness Testing for Piping Components
A351	Castings, Austenitic, for Pressure-Containing Parts
A352	Steel Castings, Ferritic and Martensitic, for Pressure-Containing Parts, Suitable for Low-Temperature Service
A353	Pressure Vessel Plates, Alloy Steel, Double-Normalized and Tempered 9% Nickel
A354	Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners
A358	Electric-Fusion-Welded Austenitic Chromium-Nickel Stainless Steel Pipe for High-Temperature Service and General Applications
A369	Carbon and Ferritic Alloy Steel Forged and Bored Pipe for High-Temperature Service
A376	Seamless Austenitic Steel Pipe for High-Temperature Service
A381	Metal-Arc-Welded Steel Pipe for Use With High-Pressure Transmission Systems
A387	Pressure Vessel Plates, Alloy Steel, Chromium-Molybdenum
A395	Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures
A403	Wrought Austenitic Stainless Steel Piping Fittings
A409	Welded Large Diameter Austenitic Steel Pipe for Corrosive or High-Temperature Service
A420	Piping Fittings of Wrought Carbon Steel and Alloy Steel for Low-Temperature Service
A426	Centrifugally Cast Ferritic Alloy Steel Pipe for High-Temperature Service
A437	Stainless and Alloy-Steel Turbine-Type Bolting Material Specially Heat Treated for High-Temperature Service

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Specification Index for Appendix A (Cont'd)

Spec. No.	Title
ASTM (Cont'd)	
A451	Centrifugally Cast Austenitic Steel Pipe for High-Temperature Service
A453	High-Temperature Bolting, with Expansion Coefficients Comparable to Austenitic Stainless Steels
A479	Stainless Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels
A487	Steel Castings Suitable for Pressure Service
A494	Castings, Nickel and Nickel Alloy
A515	Pressure Vessel Plates, Carbon Steel, for Intermediate- and Higher-Temperature Service
A516	Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower-Temperature Service
A524	Seamless Carbon Steel Pipe for Atmospheric and Lower Temperatures
A536	Ductile Iron Castings
A537	Pressure Vessel Plates, Heat-Treated, Carbon-Manganese-Silicon Steel
A553	Pressure Vessel Plates, Alloy Steel, Quenched and Tempered 7, 8, and 9 % Nickel
A563	Carbon and Alloy Steel Nuts
A571	Austenitic Ductile Iron Castings for Pressure-Containing Parts Suitable for Low-Temperature Service
A587	Electric-Resistance-Welded Low-Carbon Steel Pipe for the Chemical Industry
A645	Pressure Vessel Plates, 5 % and 5 ½ % Nickel Alloy Steels, Specially Heat Treated
A671	Electric-Fusion-Welded Steel Pipe for Atmospheric and Lower Temperatures
A672	Electric-Fusion-Welded Steel Pipe for High-Pressure Service at Moderate Temperatures
A675	Steel Bars, Carbon, Hot-Wrought, Special Quality, Mechanical Properties
A691	Carbon and Alloy Steel Pipe, Electric-Fusion-Welded for High-Pressure Service at High Temperatures
A694	Carbon and Alloy Steel Forgings for Pipe Flanges, Fittings, Valves, and Parts for High-Pressure Transmission Service
A696	Steel Bars, Carbon, Hot-Wrought or Cold-Finished, Special Quality, for Pressure Piping Components
A707	Forged Carbon and Alloy Steel Flanges for Low-Temperature Service
A789	Seamless and Welded Ferritic/Austenitic Stainless Steel Tubing for General Service
A790	Seamless and Welded Ferritic/Austenitic Stainless Steel Pipe
A813	Single- or Double-Welded Austenitic Stainless Steel Pipe
A814	Cold-Worked Welded Austenitic Stainless Steel Pipe
A815	Wrought Ferritic, Ferritic/Austenitic, and Martensitic Stainless Steel Piping Fittings
A860	Wrought High-Strength Ferritic Steel Butt-Welding Fittings
A928	Ferritic/Austenitic (Duplex) Stainless Steel Pipe Electric Fusion Welded with Addition of Filler Metal
A992	Structural Steel Shapes
A995	Castings, Austenitic-Ferritic (Duplex) Stainless Steel, for Pressure-Containing Parts
A1010	Higher-Strength Martensitic Stainless Steel Plate, Sheet, and Strip
A1011	Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
A1053	Welded Ferritic-Martensitic Stainless Steel Pipe
B21	Naval Brass Rod, Bar, and Shapes
B26	Aluminum-Alloy Sand Castings
B42	Seamless Copper Pipe, Standard Sizes
B43	Seamless Red Brass Pipe, Standard Sizes
B61	Steam or Valve Bronze Castings
B62	Composition Bronze or Ounce Metal Castings
B68	Seamless Copper Tube, Bright Annealed
B75	Seamless Copper Tube
B88	Seamless Copper Water Tube
B96	Copper-Silicon Alloy Plate, Sheet, Strip, and Rolled Bar for General Purposes and Pressure Vessels
B98	Copper-Silicon Alloy Rod, Bar and Shapes
B127	Nickel-Copper Alloy (UNS N04400) Plate, Sheet, and Strip
B148	Aluminum-Bronze Sand Castings
B150	Aluminum Bronze Rod, Bar and Shapes
B152	Copper Sheet, Strip, Plate and Rolled Bar
B160	Nickel Rod and Bar
B161	Nickel Seamless Pipe and Tube
B162	Nickel Plate, Sheet and Strip
B163	Seamless Nickel and Nickel Alloy Condenser and Heat Exchanger Tubes
B164	Nickel-Copper Alloy Rod, Bar, and Wire
B165	Nickel-Copper Alloy (UNS N04400) Seamless Pipe and Tube
B166	Nickel-Chromium-Iron Alloys (UNS N06600, N06601, N06603, N06690, N06693, N06025, N06045, and N06696), Nickel-Chromium-Cobalt-Molybdenum Alloy (UNS N06617), and Nickel-Iron-Chromium-Tungsten Alloy (UNS N06674) Rod, Bar, and Wire

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