

**NOTICE REGARDING CODE CASES OF
THE ASME B31 CODE FOR PRESSURE PIPING**

All B31 Code Cases in effect as of September 21, 2007 will remain available for use unless annulled by the B31 Standards Committee.

CASES OF THE CODE FOR PRESSURE PIPING – B31

B31 CASE 180

Leak Testing of Subassemblies of Jacketed Piping for use in ASME B31.3 Piping Systems

Approval Date: January 5, 2007

Inquiry: Does ASME B31.3 permit an alternate leak test for jacketed piping in which it is impracticable to visually examine the welded joints and connections for leaks in accordance with para. 345.2.2(a)?

Reply: Visually observing the joints and connections during the leak test in accordance with para. 345.2.2(a) and 345.3.1 is not required provided all of the following conditions are satisfied:

1. The welded joints and connections are on the inner pipe of jacketed piping.
2. A leak test is performed that otherwise meets the requirements of para. 345.1 except visual examination of joints and connection in accordance with para. 345.2.2(a) and 345.3.1 is not required.
3. A sensitive leak test is performed in accordance with para. 345.8 to demonstrate leak tightness of welded joints and connections that are not visually examined during the leak testing requirements in 2 above.

B31 CASE 181

Use of Alternative Ultrasonic Examination Acceptance Criteria

ANNULLED

Annulment Date: June 25, 2018

Reason: Code Case 181 has been incorporated into Appendix R in B31.3-2016 Edition.

ASME B31.3 CASES

B31 CASE 184

Use of Ultrasonic Examination of Welds as an Alternative to Radiographic Examination in ASME B31.3, Chapter IX

ANNULLED

Annulment Date: 03/31/2011 (Date of Issuance of B31.3-2010 Edition)

Reason: Code Case 184 shall expire upon the publication of ASME B31.3–2010 Edition.

CASES OF THE CODE FOR PRESSURE PIPING – B31

ASME B31.3 CODE CASE 185

Title: Use of Standard Helium Leak Test for a Vacuum-only Piping System (Paragraph 345)

Approval Date: December 22, 2009

Inquiry:

Under what circumstances does ASME B31.3 permit the use of helium mass spectrometer leak tests performed under a vacuum as a substitute for the leak test requirements specified in ASME B31.3, para. 345?

Reply:

In the opinion of the Committee, the qualified helium leak tests under vacuum conditions in the ASME BPV Code, Section V, Article 10, Appendix V and Appendix IX are acceptable substitutes for the testing requirements identified in para. 345 of ASME B31.3 provided the following conditions are met:

1. The piping system is expected to operate only under vacuum (i.e., sub-atmospheric pressure) conditions.
2. Any leakage into the piping system that could result in an internal reaction (e.g., combustion or explosion) that increases the pressure above atmospheric shall be prevented.
3. All system joints and connections shall be leak tested. Piping welds and joints to be tested shall be uninsulated and exposed, and shall not be primed, painted or otherwise coated.
4. Helium leak testing is performed at vacuum conditions sufficient for the mass spectrometer helium leak tests of ASME BPV Code, Section V, Article 10, Appendices V and IX, or at pressures below 10 millibars absolute (<1% of atmospheric pressure), whichever is lower.
5. ASME B31.3, para. 345.2 applies, except for the minimum “10 min” leak test period, the leak test pressure requirements and the limitation of the need for access for jacketed piping to “visual access.” Para. 345.3 also applies, except for the leak test pressure requirements. All other inspection, examination and records requirements of ASME B31.3 Chapter VI must still be satisfied (i.e., paras. 340, 341, 342, 343, 344 and 346).
6. Written procedures shall be qualified, in accordance with BPV Code, Section V, Article 10.
7. Test personnel shall have training and certification consistent with ASME B31.3, para. 342.

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8. Test reports, including records of personnel qualifications, shall meet the requirements of ASME BPV Code, Section V, Article 10, Item T-1091 and shall be retained for at least five years.
 9. Options of the ASME BPV Code, Section V, Article 10 test methods, which allow the engineering design to modify specified requirements of the Appendix V and Appendix IX test methods (such as acceptability limits for system leak tightness), may only be exercised so as to make these requirements more sensitive or more conservative.
 10. The use of the vacuum leak test instead of the pressurized leak test of ASME B31.3, para. 345 shall be specified in the engineering design and shall be accepted by the Owner.
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B31 CASE 188

Minimum Hydrostatic Test Pressure for ASME B31.3, Chapter IX (Para. K345.4.2)

ANNULLED

Annulment Date: February 27, 2015

Reason: Requirements incorporated in ASME B31.3 Code.

B31 Code Case 191
Cu-13Zn-1.1Ni-Si-Al Alloy Seamless Pipe and Tube
ASME B31.3
Approval Date: January 21, 2015

Inquiry: May precipitation-hardened (Temper Designation TF00) Cu-13Zn-1.1Ni-Si-Al alloy (UNS No. C69100) seamless pipe and tube conforming to the requirements of ASTM B706-00 (R2011) be used under the rules of ASME B31.3?

Reply: Yes, provided:

- (a) The maximum allowable stress values for the material shall be those given in Table 1;
- (b) Welded and brazed construction is not permitted;
- (c) The maximum use temperature shall be 204°C (400°F);
- (d) Certification to the ASTM B706-00 (R2011) specification requirements shall be mandatory.

Table 1
Maximum Allowable Stress Values

For Metal Temperature Not Exceeding, °F	Stress, ksi		For Metal Temperature Not Exceeding, °C	Stress, MPa
100	20.0		40	138
150	20.0		65	138
200	20.0		100	138
250	20.0		125	138
300	20.0		150	138
350	19.9		175	137
400	19.5		200	135
			225	132

Note: The maximum use temperature for this alloy is 204°C (400°F).
The value listed at 225°C is provided for interpolation purposes only.

Note: The maximum use temperature for this alloy is 177°C (350°F):
The value listed at 200°C is provided for interpolation purposes only.

B31 Case 196

Ductile Iron Casting UNS No. F33100

ANNULLED

Annulment Date: January 24, 2022

Reason: Incorporated in ASME B31.3-2016 Edition.

B31 Case 202

Approval Date: November 14, 2017

Heavy Walled Fittings

ASME B31.3 Process Piping

Inquiry: What alternate calculation method for pressure design may be used to determine the required reinforcement for a heavy wall branch connection fitting (lateral, wye, or tee) in accordance with ASME B31.3, Para. 304.3.3?

Reply: It is the opinion of the Committee that the “pressure area” method,¹ as described herein, is an acceptable alternate calculation method to determine the required metal reinforcement for a heavy wall branch connection fitting (lateral, wye, or tee) in accordance with ASME B31.3 Para. 304.3.3.

Nomenclature:

A = Metal areas (see Figures 1, 2, and 3), mm² (in.²).

B = Metal areas (see Figures 1 and 2), mm² (in.²).

D₁ = Run pipe inside diameter, less corrosion allowance, mm (in.).

D₂ = Branch pipe inside diameter, less corrosion allowance, mm (in.).

E = Pressure areas (see Figures 1, 2, and 3), mm² (in.²).

F = Pressure areas (see Figures 1 and 2), mm² (in.²).

G = The width of the lateral branch opening at the inside surface of the run pipe (see Figure 1), mm (in.).

P = Design (gage) pressure, kPa (psi).

S = Material allowable stress from B31.3 Table A-1 for the design temperature, kPa (psi).
(If a casting is to be qualified for pressure, the material allowable stress shall be multiplied by the appropriate B31.3 casting quality factor.)

t₁ = Thickness in the fitting heel (see Figures 1 and 2) or run radial thickness in the fitting crotch (see Figure 3), mm (in.).

t₂ = Thickness in the fitting crotch (see Figures 1 and 2) or branch radial thickness in the fitting crotch (see Figure 3), mm (in.).

t'₁ = Nominal thickness of the matching run pipe connected to the fitting (see Figures), mm (in.).

t'₂ = Nominal thickness of the matching branch pipe connected to the fitting (see Figures), mm (in.).

α = The angle between the branch pipe centerline and the fitting crotch centerline, deg (see Figures 1 and 2).

β = The angle between the fitting crotch centerline and the run pipe centerline, deg (see Figure 1).

¹ The “pressure area” method was originally published in the 1956 revised 2nd edition of the MW Kellogg, *Design of Piping Systems*.

General Requirements

1. The fitting shall be manufactured from a single metal casting or forging.
2. The fitting ends shall not be within the envelope of the metal and pressure areas used to qualify the fitting and there shall be sufficient material beyond the envelope to make an acceptable weld end (see ASME B16.25).
3. The t'_1 and t'_2 dimensions of the fitting shall be equal to or greater in thickness than the nominal dimensions of the matching piping. If the fitting is a weaker material than the matching piping, transition pieces may be necessary for the connected piping to match t'_1 and t'_2 dimensions of the fitting determined in accordance with the straight pipe requirements of B31.3, as appropriate.
4. All inside and outside corners of the fittings larger than NPS 2 shall be radiused. It is recommended that inside radii be a minimum $t/4$ and outside radii be a minimum $t/2$, where t is the lesser of t'_1 and t'_2 , except that these radii shall not be less than 3 mm (1/8 in.) and need not be greater than 25 mm (1 in.).
5. For internally and externally contoured fittings the metal and pressure areas may be represented by quadrilaterals and/or triangles assembled such that they approximate the respective areas:
 - (A) for the metal areas: the areas of the largest non-overlapping quadrilaterals and/or triangles may be summed provided all the areas lie within the areas defined by the fitting inside and outside surfaces and side lengths defined in the appropriate figures; and
 - (B) for the pressure areas: the areas of the non-overlapping quadrilaterals and/or triangles shall be summed that totally circumscribe and cover the areas defined by the fitting crotch and pipe centerlines, the fitting inside surfaces, and the side lengths defined in the appropriate figures.
6. For laterals (Figure 1) with an $(\alpha + \beta)$ angle greater than or equal to 85 degs, the requirements for the tee (Figure 3) may be used. Otherwise the requirements for the lateral shall be used.
7. Consideration shall be made for required examination of the pipe to fitting joint. A short tangent may improve the reading of a radiograph or facilitate the performance of ultrasonic examination, especially if there is a significant transition from the pipe to the fitting.
8. The fitting's manufacturing tolerance shall be considered.

Calculated Dimensions

The side length dimensions for calculating metal and pressure areas for the various fittings are as follows:

For the lateral (see Figure 1) where $(\alpha + \beta) \geq 45$ deg

$$\text{Run crotch side length} = \frac{G}{2} + t_2 \cos \frac{\beta}{2}$$

$$\text{Run heel side length} = \frac{G}{2} + t_1 \cos \frac{(\alpha + \beta)}{2}$$

$$\text{Branch crotch side length} = \frac{D_2}{2} + t_2 \cos \frac{\alpha}{2}$$

$$\text{Branch heel side length} = \frac{D_2}{2} + t_1 \cos \frac{(\alpha + \beta)}{2}$$

For the wye (see Figure 2) where $\alpha \geq 45$ deg

$$\text{Run heel side length} = \frac{D_1}{2} + t_1 \cos \frac{\alpha}{2}$$

$$\text{Branch crotch side length} = \frac{D_2}{2} + t_2 \cos \alpha$$

$$\text{Branch heel side length} = \frac{D_2}{2} + t_1 \cos \frac{\alpha}{2}$$

For the tee (see Figure 3)

$$\text{Run side length} = \frac{D_2}{2} + t_2$$

$$\text{Branch side length} = \frac{D_2}{2} + t_1$$

Acceptance Criteria

The following equations shall be met for both the crotch and heel sides of the fitting. For the tee only Equation (1) need be met because of symmetry.

$$S \geq \frac{P\left(E + \frac{A}{2}\right)}{A} \quad (1)$$

$$S \geq \frac{P\left(F + \frac{B}{2}\right)}{B} \quad (2)$$

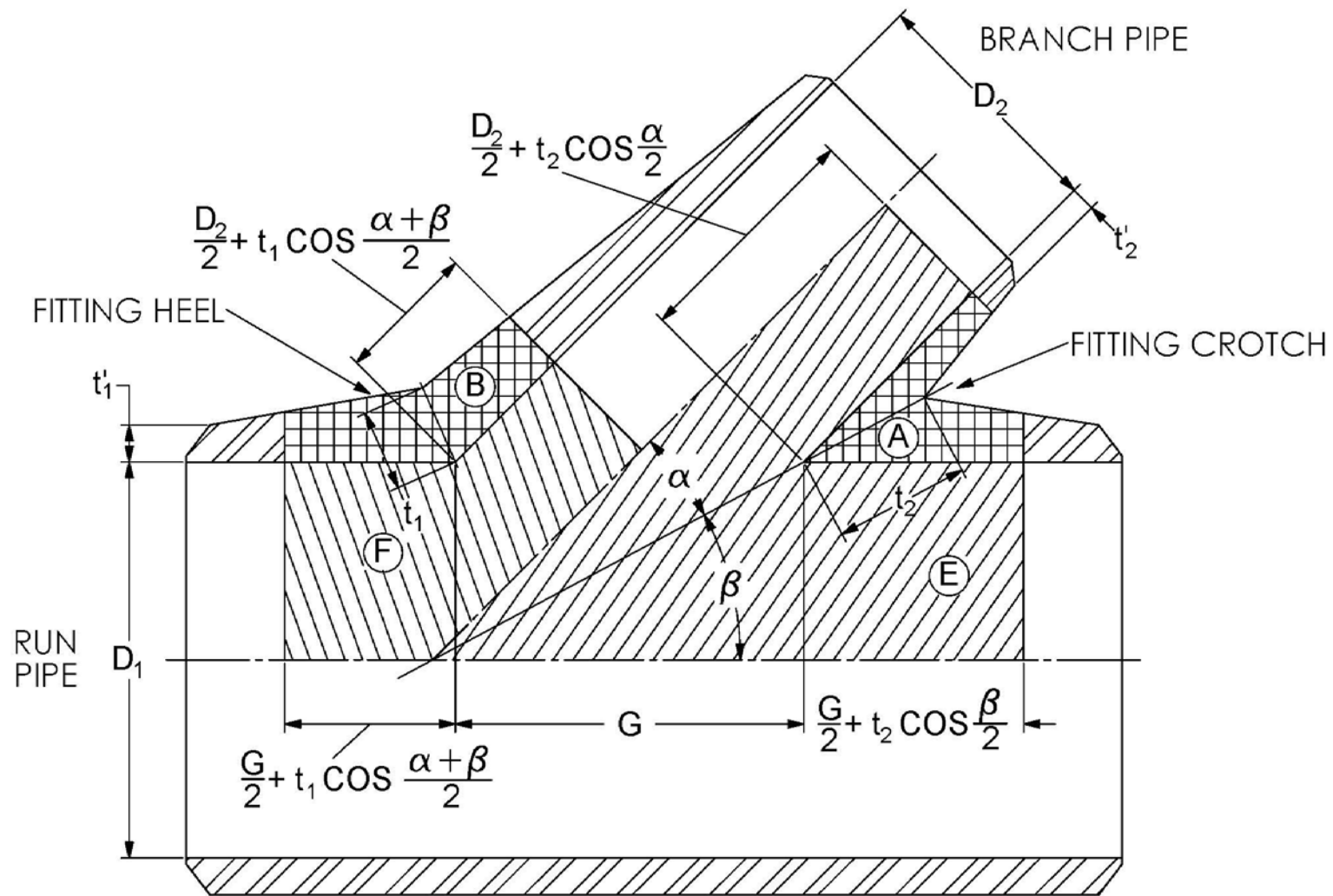


FIGURE 1 - LATERAL FITTING

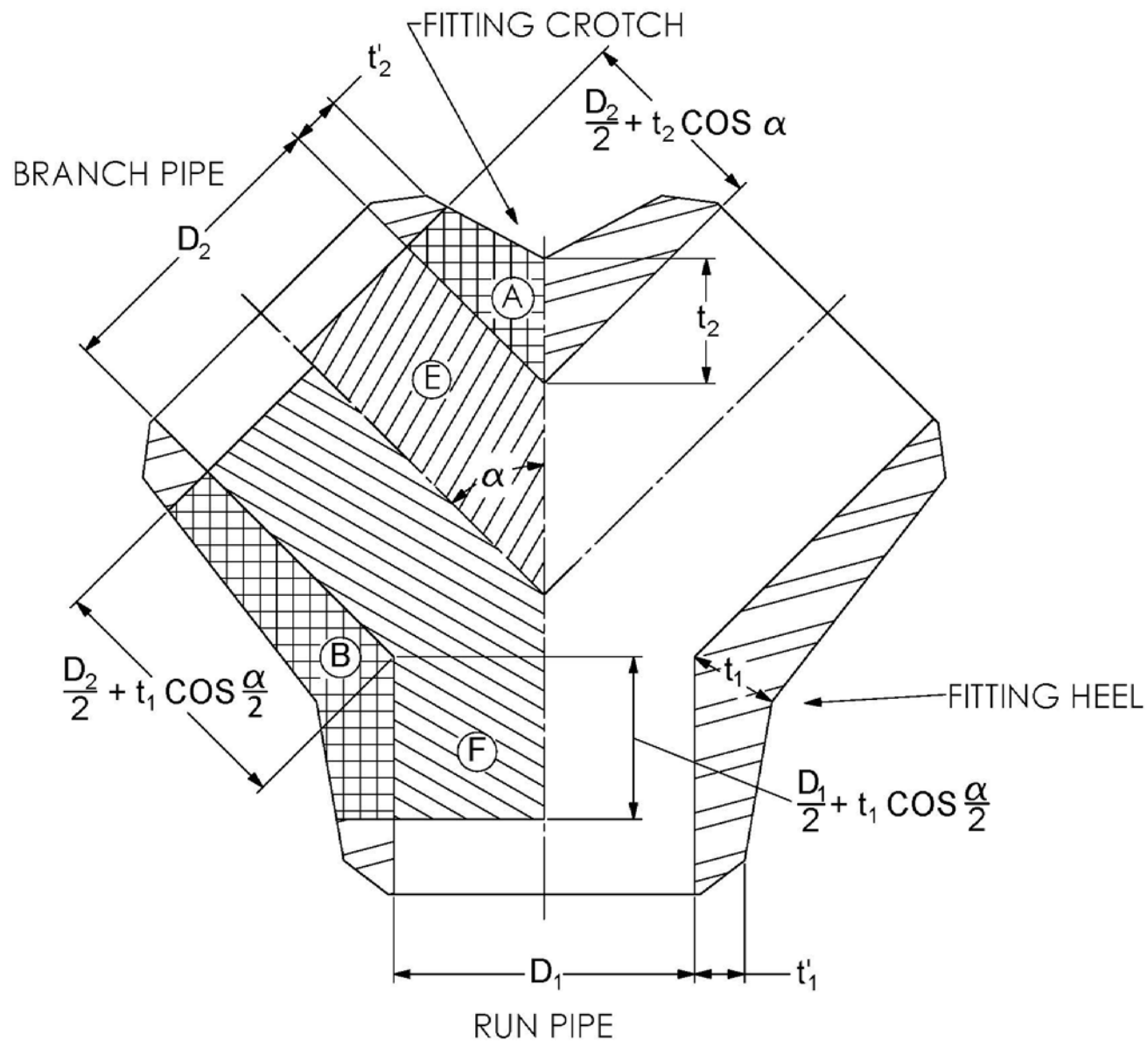


FIGURE 2 - WYE FITTING

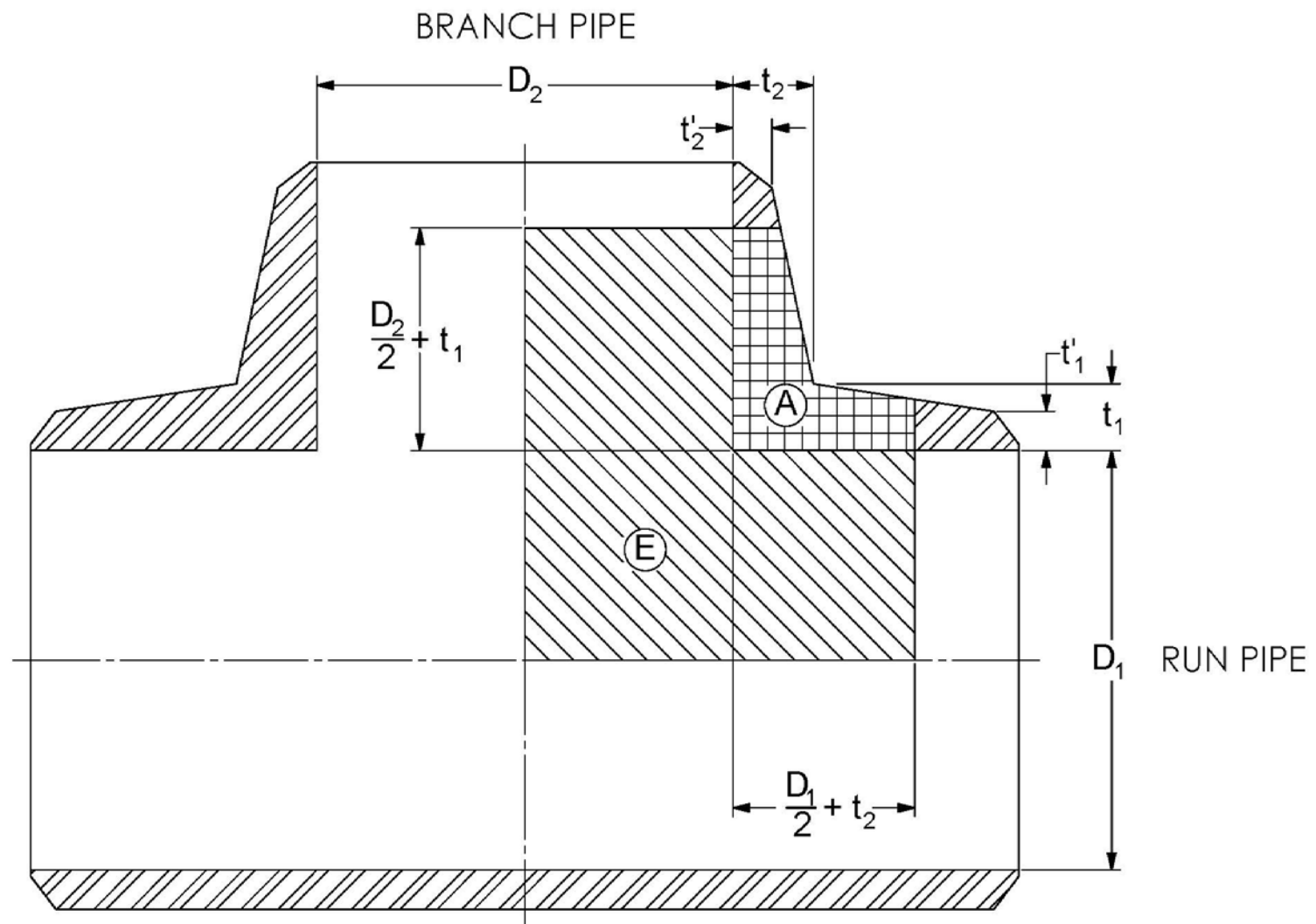


FIGURE 3 - TEE FITTING

B31 Code Case 208-1
Approval Date: January 24, 2022
ASME B31.3 Process Piping

18Cr-11Ni-Cb-N, 347LN UNS S34751 Austenitic Stainless Steel Seamless Tubes, Seamless and Welded Pipe, Pipe Flanges, Forged Fittings, Valves and Parts, Wrought Piping Fittings, Forgings and Plate and Sheet
ASME B31.3

Inquiry: May UNS S34751 solution annealed austenitic stainless steel seamless tubes, seamless and welded pipe, pipe flanges, valves and parts, wrought piping fittings, forgings, plate and sheet meeting the requirements of ASTM A213/A213M-21a, A312/A312M-21, A376/A376M-19, A358/A358M-19, A182/A182M-21, A403/A403M-20, A965/A965M-21, and A240/A240M-20a be used in welded construction under the rules of ASME B31.3?

Reply: Yes, provided that the following additional requirements are met:

- (a) The maximum allowable stress values shall be as given in Table 1.
- (b) The maximum use temperature is 677°C (1250°F).
- (c) The material shall be considered as P-No 8, Group 1.
- (d) For temperatures above 538°C (1000°F), the stress values in Table 1 may be used only if the material has been heat treated at a temperature of 1040°C (1900°F) minimum.
- (e) The minimum design temperature for this material shall be -200°C (-325°F), however, when a specification permits this material to be furnished without solution heat treatment or with other than a solution heat treatment, the minimum design temperature shall be -29°C (-20°F) unless the material is impact tested in accordance with para. 323.3.
- (f) For post fabrication strain limits in the lower temperature range exceeding design temperature 540°C (1000°F) and forming strain of 15% and in the high temperature range exceeding 675°C (1250°F) and forming strains of 10%, the minimum heat treatment temperature shall be 1040°C (1900°F).

Table 1 Maximum Allowable Stress Values				
For Metal Temperature Not Exceeding, °C	Allowable Stress [Note (1)], MPa		For Metal Temperature Not Exceeding, °F	Allowable Stress [Note (2)], ksi
40	138		100	20.0
65	138		200	20.0
100	138		300	20.0
125	138		400	19.7
150	138		500	18.3
175	138		600	17.4
200	137		650	17.2
225	132		700	17.0
250	128		750	16.9
275	124		800	16.8
300	122		850	16.8
325	120		900	16.8
350	118		950	16.8
375	117		1000	16.7
400	116		1050	16.6
425	116		1100	12.9
450	116		1150	9.56
475	116		1200	7.03
500	116		1250	5.11
525	115		Note (2): The fonts used are in accordance with B31.3 Table A-1 Note 4a.	
550	115			
575	111			
600	83.0			
625	63.2			
650	47.8			
675	35.9			
700	26.9[Note (3)]			
Note (1): The fonts used are in accordance with B31.3 Table A-1 Note 4b				
Note (3): The maximum use temperature for this alloy is 677°C (1250°F). The value listed at 700°C is provided for interpolation purposes only.				

B31 Case 209

Piping System Stress Analysis Examples

ANNULLED

Annulment Date: January 24, 2022

Reason: Code Case 209 no longer needed as Appendix S has been updated to align with the base code in the B31.3-2020 Edition.

B31 Code Case 214
Approval Date: May 30, 2019
ASME B31.3 Process Piping

Alternative Heat Treatments for Fabrication Processes

Proposal: Code Case to allow the use of ASME B31P, Standard Heat treatments for Fabrication Processes as an alternative to the preheat, PWHT, and PFHT required by B31.3.

Explanation: ASME B31P, Standard Heat treatments for Fabrication Processes, was published in May 2018. In order to allow the use of this Standard by the ASME Codes prior to changes being adopted in the next edition of the respective Codes this Code Case is being proposed to allow B31P to be used as an alternative to the rules currently in the published ASME B31 Codes. A similar Code Case is currently being balloted in ASME B31.1 (18-2339).

Summary of Changes: To allow the use of ASME B31P, Standard Heat Treatments for Fabrication Processes, as an alternative to the heat treatment rules specified in ASME B31. 3.

Referenced Code: ASME B31.3 – 2016 & 2018

Inquiry: May the heat treatment requirements specified in ASME B31P be used as an alternative to the required heat treatments specified in paras. 330, 331, and 332 of ASME B31.3?

Reply: It is the opinion of the Committee that the heat treatments specified in ASME B31P may be used as an alternative to the respective heat treatments specified in ASME B31.3 for the materials referenced in ASME B31P.

B31 Code Case 216
Approval Date: March 29, 2021
ASME B31.3 Process Piping

Use of Enhanced Pressure Ratings for Brazed Copper Tubes and Fittings by Cold Stretch Process

Inquiry: Under what condition may higher pressure ratings be used for ASTM B88 Type L tubes and ASME B16.22 fittings in ASME B31.3 construction?

Reply: It is the opinion of the Committee that enhanced pressure ratings may be used for ASTM B88 Type L tubes and ASME B16.22 fittings in ASME B31.3 construction provided the following conditions are met:

- (a) The tubes shall conform to ASTM B88 Type L in the H58 temper.
- (b) The fittings shall conform to ASME B16.22.
- (c) The maximum design temperature is 38°C (100°F).
- (d) The piping shall be limited to Category D and Normal Fluid Services.
- (e) External pressure is not permitted.
- (f) The maximum tube and fitting nominal or standard size is 3 in.
- (g) The joints shall be brazed. The qualification of brazing procedures, brazers, and brazing operators shall be in accordance with para. 328.2. Silver brazing filler metals (BAg-XX) with appropriate flux shall be used in the brazing process.
- (h) In brazing qualification, the specimen in the tension test shall break in the base metal outside of the joint with tensile strength equal to or greater than (207 MPa) 30 ksi.
- (i) The piping system shall receive a cold stretch operation by hydrostatic or pneumatic pressure test in accordance with para. 345, except the minimum test pressure shall be 1.7 times the design pressure and the maximum test pressure shall be 1.8 times the design pressure. The test pressure shall be maintained for at least 20 min.
- (j) The internal design gage pressure, P , shall not exceed the pressure calculated as follows:

$$P = \frac{2St}{D - 0.8t}$$

Where $S = 68.9$ MPa (10.0 ksi)

t = minimum wall thickness, for ASTM B88 Type L

D = maximum outside diameter, for annealed temper ASTM B88 Type L

- (k) Piping flexibility analysis shall be performed in accordance with para. 319 using the basic allowable stresses (S_c and S_h) equal to 41.4 MPa (6.0 ksi).
- (l) Analysis of sustained loads shall be performed in accordance with para. 320 using the basic allowable stresses (S_h) equal to 41.4 MPa (6.0 ksi).
- (m) Before cold stretch operation, the brazed joints shall be 100% visually examined. The following conditions are not permitted:
 - 1) The presence of flux residue and unmelted filler metal
 - 2) Excessive oxidation of the joint
 - 3) Cracks in braze metal or base material

- (n) Additional brazing is not permitted after the cold stretch operation. If a braze repair is required, the following conditions shall be satisfied:
 - 1) The braze joint to be repaired shall be removed and replaced along with 150 mm (6 in.) of tube on each side of the joint.
 - 2) The piping shall receive the cold stretch operation as required in (i).
- (o) The design, cold stretch and repair records shall be retained by the owner for the life of the piping.

B31 Code Case 217
Approval Date: September 3, 2021
ASME B31.3 Process Piping

Alternative NDE Personnel Qualification and Certification Requirements

Referenced Code: ASME B31.3 – 2018 & 2020

Inquiry: May alternative personnel qualification and certification requirements be used as options to those specified in ASME B31.3, para. 342.1?

Reply: It is the opinion of the Committee that the personnel qualification and certification requirements below may be used as alternatives to those specified in ASME B31.3, para. 342.1:

Personnel performing nondestructive examination to the requirements of this Code shall be qualified and certified for the method to be utilized in accordance with their employer's written practice. The written practice shall be based on the training, examination, and experience requirements of one of the following:

- (a) ASME BPVC, Section V, Article 1
- (b) ASNT CP-189,
- (c) ASNT SNT-TC-1A,
- (d) Other national or international central certification program or standard