B31.1 — Cases No. 25

A Case is the official method of handling a reply to an inquiry when study indicated that the Code wording needs clarification, or when the reply modifies the existing requirements of the Code, or grants permission to use new materials or alternative constructions.

ASME has agreed to publish Cases issued by the B31 Committee concerning B31.1 as part of the update service to B31.1. The text of proposed new and revised Cases and reaffirmations of current Cases appear in *Mechanical Engineering* for public review. A notice also appears in *Mechanical Engineering* when new and revised Cases are approved. New and revised Cases, as well as announcements of reaffirmed Cases and annulments, then appear in the next update. All Cases currently in effect at the time of publication of the 1989 Edition of the Code were included in the update that immediately followed, Interpretations No. 14 and Cases No. 9. As of the 1992 and later Editions, all Cases currently in effect at the time of publication of an Edition are included with it as an update.

This update, Cases No. 25, which is included after the last page of the 1998 Edition, contains the following Cases.

145	147	153	159	162	164	168
146-1	151	154	161	163	165	

Cases 155-1, 156, 157, 158, and 160, which were included in the first update to the 1995 Edition (Cases No. 20), were allowed to expire. Case 166, which was included in the third update (Cases No. 22), was also allowed to expire.

The page numbers for the Cases supplements included with updates to the 1998 Edition start with C-1 and will continue consecutively through the last update to this Edition. The Cases affected by this supplement are as follows:

Page	*Location*	*Change*
C-3, C-4	Case 146-1	(1) Reaffirmed: March 1998 (2) New expiration date: March 31, 2001
C-7, C-8	Case 151	(1) Reaffirmed: May 1998 (2) New expiration date: May 31, 2001
C-23, C-24	Case 165	(1) Reaffirmed: July 1998 (2) New expiration date: July 31, 2001

B31 CASE 145
Nickel–Molybdenum–Chromium Alloys (UNS N10276), ANSI/ASME B31.1 Construction

Approval Date: August 1985
Reaffirmation Date: July 1997

This case shall expire on July 31, 2000, unless previously annulled or reaffirmed

Inquiry: May nickel–molybdenum–chromium alloy (UNS N10276) fittings, rod, plate, and strip, seamless and welded pipe and tube conforming to ASTM B 366, B 574, B 575, B 619, B 622, and B 626 be used for ANSI/ASME B31.1 construction?

Reply: It is the opinion of the Committee that nickel–molybdenum–chromium alloy (UNS N10276) may be used in ANSI/ASME B31.1 construction provided:

(1) the maximum allowable stress values for the material shall be those given in Table I. For welded components, these values shall be multiplied by a factor of 0.85.

(2) welded fabrication shall conform to the applicable requirements of B31.1:

(a) Welding Procedure and Performance Qualifications shall be conducted in accordance with Section IX, ASME Boiler and Pressure Vessel Code.

(b) Welding shall be done by any welding process capable of meeting the requirements.

(c) All filler metal, including consumable insert material, shall comply with the requirements of Section IX.

(d) When welding repair of a defect is required, it shall be in accordance with ANSI/ASME B31.1, para. 127.4.11. When a defect is removed but welding repair is unnecessary, the surface shall be contoured to eliminate any sharp notches or corners. The contoured surface shall be reinspected by the same means originally used for locating the defect to assure it has been completely removed.

(e) Heat treatment after fabrication or forming is neither required nor prohibited.

(3) this Case number shall be identical in the Data Report.

TABLE I

For Metal Temperature Not Exceeding, °F	Maximum Allowable Stress, ksi[1]	Maximum Allowable Stress, ksi
100	25.0	25.0
200	25.0	25.0
300	25.0	23.0
400	24.3	21.2
500	23.9	20.0
600	23.5	18.8
650	23.3	18.3
700	23.1	17.8
750	22.9	17.4
800	22.8	17.1
850	22.6	16.8
900	22.3	16.6
950	22.1	16.5
1000	21.8	16.5

NOTE:
(1) Due to the relatively low yield strength of these materials, these higher stress values were established at temperatures where the short time tensile properties govern to permit the use of these alloys where slightly greater deformation is acceptable. These higher stress values exceed 67% but do not exceed 90% of the yield strength at temperature. Use of these stresses may result in dimensional changes due to permanent strain. These stress values are not recommended for the flanges of the gasketed joints or other applications where slight amounts of distortion can cause leakage or malfunction.

B31 CASE 146-1
Nickel–Chromium–Molybdenum–Columbium Alloy (UNS N06625) in ASME B31.1 Construction

Approval Date: March 1989
Reaffirmation Date: March 1998

This case shall expire on March 31, 2001, unless previously annulled or reaffirmed

Inquiry: May nickel–chromium–molybdenum–columbium alloy (UNS N06625) conforming to the specifications listed in Table I be used for construction of ASME B31.1 Power Piping systems?

Reply: It is the opinion of the Committee that nickel–chromium–molybdenum–columbium alloy (UNS N06625) conforming to the product specifications shown in Table I may be used in the construction of power piping complying with the rules of ASME B31.1 provided the following additionl requirements are met.

(1) THESE MATERIALS SHALL NOT BE USED FOR BOILER EXTERNAL PIPING. See para. 100.1.2(A).

(2) The allowable stress values shall be those listed in Table II.

(3) All longitudinal welds in any of the materials listed in Table I shall be completely examined by radiography. Radiographic examination shall be in accordance with the requirements of the ASME Boiler and Pressure Vessel Code, Section VIII, latest edition, para. UW-51.

(4) The welding procedure qualification and performance qualifications shall be conducted in accordance with ASME Boiler and Pressure Vessel Code, Section IX. For qualifying welding procedures, the material is P-No. 43.

(5) Postweld heat treatment of this material is neither required nor prohibited. However, no postweld heat treatment shall be performed except by agreement between the owner and the manufacturer, installer, or erector. The temperature, time, and method of heat treatment shall be covered by the agreement.

(6) Longitudinally seam welded pipe, with or without filler metal added, is permitted. Longitudinally seam welded pipe shall be fabricated from plate meeting the requirements of ASTM B 443. All seam welded pipe shall comply with the following requirements.

(a) The welds shall be made by an electric arc process.

(b) The joints shall be full penetration double-welded or single-welded butt joints employing fusion welding processes as defined under para. 100.2 Definitions of ASME B31.1. Where backing rings or strips are used, the ring or strip material shall be of the same P-Number as the plate being joined. Backing rings or strips shall be completely removed after welding prior to radiography, and the exposed weld surface shall be examined visually for conformance to the requirement of the following paragraph. Welds made by procedures using backing rings which remain in place are prohibited.

(c) The weld surface on the outside diameter side of the pipe shall be flush with the base plate or shall have a reasonably uniform crown in accordance with Table 127.4.2 of ASME B31.1. The weld reinforcement on the inside diameter side of the pipe may be removed at the manufacturer's option or by agreement between the manufacturer and purchaser. The contour of the reinforcement shall be reasonably smooth and free of irregularities. The deposited metal shall be fused uniformly into the plate surface. No concavity of contour is permitted.

(d) Weld defects shall be repaired by removal to sound metal and rewelding. Subsequent heat treatment and inspection shall be as required on the original welds.

(e) When heat treatment is required, such heat treatment shall be done in accordance with para. 5, after all welding.

(f) The requirements of ASTM A 530 for welded pipe shall be met. Variations in wall thickness and length for longitudinally seam welded pipe with filler metal added shall be the same as required in ASTM A 530 for seamless or longitudinally seam welded pipe without filler metal.

TABLE I

Plate, Sheet, and Strip	B 443-84
Seamless Pipe and Tube	B 444-84
Rod and Bar	B 446-84
Forgings	B 564-86
Wrought Fittings	B 366-87

TABLE II
ALLOWABLE STRESS VALUES

Spec No.	Metal Temp. [Note (1)], °F, Not Exceeding	Allowable [Notes (2), (3)] Stress Values, ksi	Spec No.	Metal Temp. [Note (1)], °F, Not Exceeding	Allowable [Notes (2), (4)] Stress Values, ksi
B 443 Grade 1	300	27.5	B 443 Grade 2	100	25.0
B 444 Grade 1	400	26.8	B 444 Grade 2	200	24.6
B 446 Grade 1	500	26.1	B 446 Grade 2	300	24.0
B 564	600	25.4	B 366 (made	400	22.5
B 366 (made	700	25.0	with Grade	500	21.7
with Grade	800	24.6	2 material)	600	21.0
1 material)	900	24.0		700	20.7
	1000	23.7		800	20.1
	1100	23.4		900	19.8
	1150	21.0		1000	19.6
	1200	13.2		1100	19.3
				1150	19.3
				1200	19.3

NOTES:
(1) Alloy 625 suffers severe loss of impact strength after longtime aging in the temperature range 1000°F–1400°F.
(2) These stress values may be interpolated to determine values for intermediate temperatures.
(3) Allowable stresses are based on 110,000 psi tensile strength, the minimum strength for annealed material (Grade 1).
(4) Allowable stresses are based on 100,000 psi tensile strength, the minimum strength for solution annealed material (Grade 2).

B31 CASE 147
Allowable Stresses for Pipe Supporting Elements, B31.1

Approval Date: August 1987
Reaffirmation Date: August 1996

This case shall expire on August 31, 1999, unless previously annulled or reaffirmed

Question: May the allowable stresses shown in MSS SP-58 for A 36 and A 307 Gr. B be used in lieu of the allowable stresses shown in B31.1, Appendix A, for pipe supporting elements?

Reply: Yes, provided all other requirements of MSS SP-58 are met.

B31 CASE 151
Use of Alloy UNS N08925 Material in ASME B31.1 Construction

Approval Date: May 1989
Reaffirmation Date: May 1998

This case shall expire on May 31, 2001, unless previously annulled or reaffirmed

Inquiry: May UNS N08925 (Nickel–Chromium–Molybdenum–Copper) stainless steel material be used for ASME B31.1 construction?

Reply: UNS N08925 material conforming to ASTM B 625-83, B 649-83, B 673-83 and B 677-84 may be used for ASME B31.1 construction provided that the following requirements are met.

(a) All applicable requirements of ASME B31.1 shall be met.

(b) THIS MATERIAL IS NOT ACCEPTABLE FOR USE ON BOILER EXTERNAL PIPING.

(c) The allowable stress values shown in Tables 1, 2, and 3 shall apply.

(d) Wrought fittings shall conform to all applicable requirements of ASTM B 366, Class WP.

(e) Forged flanges and fittings shall conform to all applicable requirements of ASTM B 462.

(f) All product forms shall be furnished in the solution annealed condition by the Material Manufacturer. The as-supplied material shall meet the mechanical properties of the material specification from which the product form was manufactured. Heat treatment after fabrication or forming is neither required nor prohibited. If heat treatment is used, the solution heat treatment shall consist of heating to a temperature of 2010°F to 2100°F followed by quenching in water or rapidly cooling by other means.

(g) Separate Welding Procedure Qualifications and Performance Qualifications shall be conducted in accordance with the requirements of Section IX of the ASME Boiler and Pressure Vessel Code.

(h) Welding electrodes or filler metals shall conform to one of the following:

SFA 5.11 ENiCrMo-3 or ENiCrMo-4
SFA 5.14 ERNiCrMo-3 or ERNiCrMo-4

TABLE 1

For Metal Temperature Not Exceeding, °F	Allowable Stress Values, ksi, for Fittings, Flanges, and Seamless Pipe
−20 to 100	21.7
200	21.7
300	20.9
400	19.6
500	18.3
600	17.3
650	16.9
700	16.9
750	16.9
800	16.9

TABLE 2

For Metal Temperature Not Exceeding, °F	Allowable Stress Values, ksi, for Welded Pipe Without Filler Metal Added [Notes (1), (2)]
−20 to 100	18.4
200	18.4
300	17.8
400	16.7
500	15.6
600	14.7
650	14.4
700	14.4
750	14.4
800	14.4

NOTES:
(1) The allowable stress values for welded pipe without filler metal added include a Weld Joint Efficiency Factor E of 0.85.
(2) The allowable stress values given in Table 1 may be used for welded pipe with 100% radiography per para. 136.4.5.

TABLE 3

For Metal Temperature Not Exceeding, °F	Allowable Stress Values, ksi, for Welded Pipe With Filler Metal Added [Notes (1), (2)]
−20 to 100	17.4
200	17.4
300	16.7
400	15.7
500	14.6
600	13.8
650	13.5
700	13.5
750	13.5
800	13.5

NOTES:
(1) The allowable stress values for welded pipe with filler metal added include a Weld Joint Efficiency Factor E of 0.80.
(2) The allowable stress values given in Table 1 may be used for welded pipe with 100% radiography per para. 136.4.5.

B31 CASE 153
Use of Alloy UNS S31803 Material in ASME B31.1 Construction

Approval Date: November 1989
Reaffirmation Date: November 1995

This case shall expire on November 30, 1998, unless previously annulled or reaffirmed

TABLE 1
ASTM PRODUCT SPECIFICATIONS

Piping	A 790-87
Tubing	A 789-87
Forgings	A 182-87
Plate, Sheet, and Strip	A 240-87
Bars and Shapes	A 276-87
Wrought Piping Fittings	A 815-86

Inquiry: May solution annealed austenitic–ferritic stainless steel, 22Cr–5½Ni–3Mo alloy (UNS S31803), materials be used in ASME B31.1 construction?

Reply: The product specifications shown in Table 1 for solution annealed ferritic–austenitic steel, 22Cr–5½Ni–3Mo alloy, may be used in the construction of power piping complying with the rules of ASME B31.1, provided the following additional requirements are met.

(1) These materials shall not be used for Boiler External Piping. See para. 100.1.2(A).

(2) Material shall be furnished in the heat treated condition. The heat treatment shall be performed at 1870°F to 2010°F with subsequent quenching in water or rapid cooling by other means.

(3) The allowable stress values shall be as follows:

For Metal Temperature Not Exceeding, °F	Max. Allowable Stress Values, ksi
100	22.5
200	22.5
300	21.7
400	20.9
500	20.4
600	20.2

(4) All longitudinal weld joints shall be completely examined by radiography. Radiographic examination shall be in accordance with the requirements of the ASME Boiler and Pressure Vessel Code, Section VIII, latest Edition, UW-51.

(5) The Welding Procedure Qualification and Performance Qualifications shall be conducted in accordance with Section IX. For qualifying welding procedures, the material shall be considered as P-No. 10H Gr. No. 1 of QW-422.

(6) Heat treatment after forming or fabrication is neither required nor prohibited [except as noted in para. (7)(e)], but any heat treatment applied shall be performed at 1870°F to 2010°F, followed by a rapid cool.

(7) Plate may be made into longitudinally welded pipe with filler metal added. Requirements of A 790 shall be met with the following modifications.

(a) The welds shall be made by an electric arc process involving the deposition of filler metal.

(b) The joints shall be full penetration double-welded or single-welded butt joints employing fusion welding processes, as defined under "Definitions," ASME Boiler and Pressure Vessel Code, Section IX. Where backing rings or strips are employed, the ring or strip material shall be of the same P-Number (QW-422 of Section IX) as the plate being joined. Backing rings or strips shall be completely removed after welding, prior to any required radiography, and the exposed weld surface shall be examined visually for conformance to the requirements of the following paragraph. Welds made by procedures employing backing rings which remain in place are prohibited.

(c) The weld surface on the O.D. side of the pipe shall be flush with the base plate or shall have a reasonably uniform crown in accordance with Table 127.4.2 in the Code. The weld surface on the I.D. side of the reinforcement may be removed at the manufacturer's option or by agreement between the manufacturer and purchaser. The contour of the reinforcement shall be reasonably smooth and free of irregularities. The deposited metal shall be fused uniformly into the plate surface. No concavity of contour is permitted unless the resulting thickness of the weld metal is equal to or greater than the minimum thickness of the adjacent base metal.

(d) Weld defects shall be repaired by removal to sound metal and rewelding. Subsequent heat treatment and inspection shall be as required on the original welds.

(e) All welding shall be done prior to heat treatment. After welding, solution heat treatment shall be in accordance with para. 2.

(8) CAUTIONARY NOTE: This Case allows the use of this material only for the temperature range given in para. (3). This material may be expected to exhibit embrittlement at room temperature after service above 600°F.

B31 CASE 154
Use of Alloy UNS N06022 Material in ASME B31.1 Construction

Approval Date: October 1989
Reaffirmation Date: October 1995

This case shall expire on October 31, 1998, unless previously annulled or reaffirmed

Inquiry: May nickel–chromium–molybdenum–tungsten alloy (UNS N06022) materials be used for ASME B31.1 construction?

Reply: Yes, the product specifications shown in Table 1 for nickel–chromium–molybdenum–tungsten alloy (UNS N06022) may be used in the construction of power piping complying with the rules of ASME B31.1, provided the following additional requirements are met.

(1) These materials shall not be used for Boiler External Piping. See para. 100.1.2(A).

(2) The maximum allowable stress values shall be as shown in Table 2. (Values listed shall be multiplied by a joint efficiency factor of 0.85 for longitudinally welded components.)

(3) Welded fabrication shall conform to the applicable requirements of B31.1.

(a) Welding Procedure and Performance Qualifications shall be conducted in accordance with Section IX, ASME Boiler and Pressure Vessel Code.

(b) All filler metal, including consumable insert material, shall comply with the requirements of Section IX.

(c) When welding repair of a defect is required, it shall be in accordance with ASME B31.1, para. 127.4.11. When a defect is removed but welding repair is unnecessary, the surface shall be contoured to eliminate any sharp notches or corners. The contoured surface shall be reinspected by the means originally used for locating the defect to assure it has been completely removed.

(d) Heat treatment after fabrication is optional.

TABLE 1
ASTM PRODUCT SPECIFICATIONS

Seamless Piping & Tubing	B 622-87a
Welded Piping	B 619-87a
Welded Tubing	B 626-87a
Wrought Pipe Fittings	B 366-88
Bar Forging and Forging Stock	B 574-85
Plate, Sheet, and Strip	B 575-86a

TABLE 2

For Metal Temperature Not Exceeding, °F	Maximum Allowable Stress, ksi [Note (1)]	Maximum Allowable Stress, ksi
100	25.0	25.0
200	25.0	25.0
300	24.8	24.5
400	23.9	22.7
500	23.2	21.2
600	22.7	20.1
650	22.6	19.6
700	22.4	19.2
750	22.3	18.9
800	22.2	18.6

NOTE
(1) Due to the relatively low yield strength of these materials, these higher stress values were established at temperatures where the short time tensile properties govern to permit the use of these alloys where slightly greater deformation is acceptable. These higher stress values exceed 67%, but do not exceed 90% of the yield strength at temperature. Use of these stresses may result in dimensional changes due to permanent strain. These stress values are not recommended for the flanges of gasketed joints or other applications where slight amounts of distortion can cause leakage or malfunction.

B31 CASE 159
Use of Copper in ASME B31.1 Construction

Approval Date: August 1992
Reaffirmation Date: August 1995

This case shall expire on August 31, 1998, unless previously annulled or reaffirmed

Inquiry: What additional rules apply to the use of copper and copper alloy instrumentation and control tubing conducting fuel gas for use on systems which are designed in accordance with the rules of ASME B31.1?

Reply: Materials listed in Table A-6 of ASME B31.1 may be used for instrumentation and control tubing conducting fuel gas, provided that the following additional requirements are met.

(a) The design pressure shall not exceed 100 psig.

(b) Only tubing which is $\frac{1}{2}$ in. outside diameter or smaller may be used.

(c) All joints shall be made using flared fittings. The use of brazed, screwed, or compression fittings is not permitted.

(d) Copper tubing shall not be used if the fuel gas contains more than 0.3 grains of hydrogen sulfide per 100 SCFM of gas.

(e) Consideration shall be given in the design to the lower strength and melting point of copper and copper alloys as compared to steel. Adequate support and protection from high ambient temperatures and vibration shall be provided.

(f) Tubing shall be installed in a guarded manner that will prevent damage during construction, operation, and service.

B31 CASE 161
Use of Alloy UNS N08926 Material in ASME B31.1 Construction

Approval Date: September 1992
Reaffirmation Date: September 1995

This case shall expire on September 30, 1998, unless previously annulled or reaffirmed

Inquiry: May UNS N08926 (Nickel–Chromium–Molybdenum–Copper–Nitrogen–Low Carbon Alloy) be used for ASME B31.1 construction?

Reply: UNS N08926 material conforming to ASTM B 366, B 462, B 625, B 649, B 673, B 674, and B 677 may be used for ASME B31.1 construction provided that the following requirements are met.

(a) All applicable requirements of ASME B31.1 shall be met.

(b) This material is not acceptable for use on boiler external piping.

(c) The allowable stress values shown in Table 1 shall apply.

(d) All product forms shall be furnished in the solution annealed condition by the Material Manufacturer. Heat treatment after fabrication and forming is neither required nor prohibited. If heat treatment is performed, the material shall be heated for a sufficient time in the range of 2010°F to 2100°F followed by quenching in water or rapidly cooling by another means.

(e) The metal shall be considered as P-No. 45. Welding electrodes or filler metal shall conform to SFA-5.11 ENiCrMo-3 or ENiCrMo-4; or SFA-5.14 ERNiCrMo-3 or ERNiCrMo-4.

(f) For pipe and tube sizes larger than those listed in B 677 and B 673, the dimensional requirements of B 464 shall be used. The maximum NPS is 30. The maximum wall thickness in any size is 1 in.

(g) Separate Welding Procedure Qualifications and Performance Qualifications shall be conducted in accordance with the requirements of Section IX of the ASME Boiler and Pressure Vessel Code.

TABLE 1
ALLOWABLE STRESS VALUES FOR B 366, B 462, B 625, B 649, B 673, B 674, AND B 677

		Maximum Allowable Stress, ksi, for Metal Temperatures, °F, not Exceeding								
Spec. No.	Notes	−20 to 100	200	300	400	500	600	650	700	750
Seamless Pipe and Tube										
B 677	(2)	23.5	23.5	22.9	21.8	20.8	20.0	19.6	19.3	19.2
B 677	...	23.5	23.5	21.3	19.9	18.7	17.9	17.7	17.6	17.5
Forged Fittings										
B 462	(2)	23.5	23.5	22.9	21.8	20.8	20.0	19.6	19.3	19.2
B 462	...	23.5	23.5	21.3	19.9	18.7	17.9	17.7	17.6	17.5
Welded Pipe and Tube										
B 673, B 674	(1), (2)	20.0	20.0	19.5	18.5	17.7	17.0	16.7	16.4	16.3
B 673, B 674	(1)	20.0	20.0	18.1	16.9	15.9	15.2	15.0	15.0	14.9
Plate, Sheet, and Strip										
B 625	(2)	23.5	23.5	22.9	21.8	20.8	20.0	19.6	19.3	19.2
B 625	...	23.5	23.5	21.3	19.9	18.7	17.9	17.7	17.6	17.5
Bar										
B 649	(2)	23.5	23.5	22.9	21.8	20.8	20.0	19.6	19.3	19.2
B 649	...	23.5	23.5	21.3	19.9	18.7	17.9	17.7	17.6	17.5
Wrought Fittings										
B 366	(2)	23.5	23.5	22.9	21.8	20.8	20.0	19.6	19.3	19.2
B 366	...	23.5	23.5	21.3	19.9	18.7	17.9	17.7	17.6	17.5
Welded Fittings										
B 366	(1), (2)	20.0	20.0	19.5	18.5	17.7	17.0	16.7	16.4	16.3
B 366	(1)	20.0	20.0	18.1	16.9	15.9	15.2	15.0	15.0	14.9

NOTES:

(1) A factor of 0.85 has been applied in arriving at the maximum allowable stress values in tension for this material. Divide tabulated values by 0.85 for maximum allowable longitudinal tensile stress.

(2) Due to relatively low yield strength of these materials, these higher allowable stress values were established at temperatures where the short time tensile properties govern to permit the use of these alloys where slightly greater deformation is acceptable. These stress values exceed 67% but do not exceed 90% of the yield strength at temperature. Use of these stress values may result in dimensional changes due to permanent strain. These values should not be used for the flanges of gasketed joints or other applications where slight amounts of distortion can cause leakage or malfunction.

B31 CASE 162
Use of 21Cr–11Ni–N Alloy (S30815) for ASME B31.1 Construction

Approval Date: September 1992
Reaffirmation Date: September 1995

This case shall expire on September 30, 1998, unless previously annulled or reaffirmed

Inquiry: May solution annealed 21Cr–11Ni–N Alloy (S30815) seamless tubes and pipes, welded tubes and pipes, plate, sheet, strip, forging, and bar, conforming to the specifications of A 213, A 312, A 249, A 358, A 409, A 240, A 182 and A 479 be used in ASME B31.1 construction?

Reply: It is the opinion of the Committee that solution annealed 21Cr–11Ni–N Alloy (UNS S30815) seamless tubes and pipes, welded tubes and pipes, plate, sheet, strip, forging, and bar as described in the Inquiry may be used in ASME B31.1 construction provided:

(a) the material meets the chemical analysis and minimum tensile requirements detailed in the specification and noted here in Tables 1 and 2, respectively; otherwise conforming to all other requirements of the respective ASTM material specification;

(b) the maximum allowable design stress values shall be as given in Table 3, except that for welded tube and pipe, a joint efficiency factor, E_j, of 0.85 shall be used;

(c) welding shall be performed using any welding process or combination of processes capable of meeting the requirements of Section IX for P-No. 8, Group No. 2 materials. If postweld heat treatment is performed, the material shall be heated to 1560–1740°F for 10–15 minutes, followed by cooling in air.

TABLE 1
CHEMICAL REQUIREMENTS

Element	Percent
Carbon	0.05–0.10
Manganese, max	0.80
Phosphorus, max	0.40
Sulphur, max	0.030
Silicon	1.40–2.00
Nickel	10.0–12.0
Chromium	20.0–22.0
Nitrogen	0.14–0.20
Cerium	0.03–0.08
(Balance Iron)	

TABLE 2
MECHANICAL PROPERTY REQUIREMENTS

Tensile strength, min, ksi	87
Yield strength, 0.2% offset min, ksi	45
Elongated in 2 in. min, %	40

(d) heat treatment after forming is neither required nor prohibited. If heat treatment is used, the solution treatment shall consist of heating to a temperature of 1920°F to 2100°F and quenching in water or rapidly cooling by other means.

(e) this Case number shall be referenced in the documentation and marking of the material and recorded on the Manufacturer's Data Report.

TABLE 3

For Metal Temperature Not Exceeding, °F	Max. Allowable Stress Values, ksi		For Metal Temperature Not Exceeding, °F	Max. Allowable Stress Values, ksi	
	...	Note (1)		...	Note (1)
100	21.8	21.8	1050	11.6	11.6
200	21.6	21.6	1100	9.0	9.0
300	20.4	20.4	1150	6.9	6.9
400	19.6	19.6	1200	5.2	5.2
500	18.4	19.1	1250	4.0	4.0
600	17.7	18.7	1300	3.1	3.1
650	17.5	18.6	1350	2.4	2.4
700	17.3	18.4	1400	1.9	1.9
750	17.1	18.2	1450	1.6	1.6
800	16.8	18.0	1500	1.3	1.3
850	16.6	17.8	1550	1.0	1.0
900	16.3	17.5	1600	0.86	0.86
950	16.1	17.2	1650	0.71	0.71
1000	14.9	14.9			

NOTE:

(1) Due to the relatively low yield strength of these materials, these higher stress values were established at temperatures where the short time tensile properties govern to permit the use of these alloys where slightly greater deformation is acceptable. These higher stress values exceed 67%, but do not exceed 90% of the yield strength at temperature. Use of these stresses may result in dimensional changes due to permanent strain. These stress values are not recommended for flanges of gasketed joints or other applications where slight amounts of distortion can cause leakage or malfunction.

B31 CASE 163
Use of Ni–Cr–Co–Mo Alloy (UNS N06617) for ASME B31.1 Construction

Approval Date: July 1994
Reaffirmation Date: July 1997

This case shall expire on July 31, 2000, unless previously annulled or reaffirmed

Inquiry: May solution annealed Ni–Cr–Co–Mo alloy (UNS N06617) wrought plate, sheet, rod, bar, forgings, welded pipe, and seamless tube that meet the chemical composition requirements given in Table 1, the mechanical property requirements given in Table 2, and that further meet all other applicable requirements of the specifications listed in Table 3 be used in ASME B31.1, welded construction at temperatures up to and including 1500°F?

Reply: It is the opinion of the Committee that solution annealed Ni–Cr–Co–Mo alloy (UNS N06617) as described in the Inquiry may be used for construction, provided that all applicable requirements of ASME B31.1 and the following additional requirements are met.

(a) This material shall not be used for boiler external piping. See para. 100.1.2(A).

(b) Material shall be solution annealed at a temperature of 2100°F–2250°F and quenched in water or rapidly cooled by other means.

(c) The maximum allowable stress values for the material shall be those given in Table 4. For welded components, these values shall be multiplied by a factor of 0.85, except when 100% radiography is performed as noted in para. 136.4.5.

(d) Separate welding procedures and performance qualifications shall be required for this material. The welding procedure qualifications and performance qualification shall be conducted as prescribed in Section IX of the ASME Boiler and Pressure Vessel Code.

(e) Heat treatment after forming or fabrication is neither required nor prohibited. When heat treatment is performed, it shall be in accordance with (b) above.

(f) For external pressure design, refer to para. 104.1.3.

(g) For para. 104.1.2, which requires a temperature dependent parameter y, the y values are the same as nickel alloys listed in Table 104.1.2(A) and shall be as follows:

1150°F and below	$y = 0.4$
1200°F	$y = 0.5$
1250°F and above	$y = 0.7$

TABLE 1
CHEMICAL REQUIREMENTS

Element	Percent
Carbon	0.05–0.15
Manganese, max.	1.0
Silicon, max.	1.0
Sulfur, max.	0.015
Iron, max.	3.0
Chromium	20.00–24.00
Cobalt	10.0–15.0
Molybdenum	8.0–10.0
Aluminum	0.8–1.5
Titanium, max.	0.6
Copper, max.	0.5
Boron, max.	0.006
Nickel, min.	44.5

TABLE 2
MECHANICAL PROPERTY REQUIREMENTS

Tensile strength, min., ksi	95
Yield strength, min., ksi	35
Elongation in 2 in. or 4 diameters, min., %	35

TABLE 3
PRODUCT SPECIFICATIONS

Rod and bar	B 166
Plate, sheet, and strip	B 168
Tube	B 444
Forgings	B 564
Welded pipe	B 546

(h) Pressure parts machined from bar shall be restricted to NPS 4 or smaller. Hubbed flanges, elbows, return bends, tees, and header tees shall not be machined directly from bar stock.

TABLE 4

For Metal Temperature Not Exceeding, °F	Maximum Allowable Stress, ksi	Maximum Allowable Stress, ksi [Note (1)]
100	23.3	23.3
200	20.5	23.3
300	19.1	23.3
400	18.1	23.3
500	17.3	23.3
600	16.7	22.5
700	16.2	21.9
800	15.9	21.5
900	15.7	21.1
1000	15.5	20.9
1100	15.4	20.7
1150	15.4	20.7
1200	15.3	16.9
1250	13.0	13.0
1300	10.0	10.0
1350	7.7	7.7
1400	6.0	6.0
1450	4.6	4.6
1500	3.6	3.6

NOTE:

(1) Due to the relatively low yield strength of this material, these higher stress values were established at temperatures where the short time tensile properties govern to permit the use of these alloys where slightly greater deformation is acceptable. These higher stress values exceed 67%, but do not exceed 90% of the yield strength at temperature. Use of these stresses may result in dimensional changes due to permanent strain. These stress values are not recommended for flanges of gasketed joints or other applications where slight amounts of distortion can cause leakage or malfunction.

B31 CASE 164
Use of Micro-Alloyed Carbon Steel Bar in ASME B31.1 Construction

Approval Date: September 1994
Reaffirmation Date: September 1997

This case shall expire on September 30, 2000, unless previously annulled or reaffirmed

Inquiry: May micro-alloyed carbon steel bar with additions of aluminum, vanadium, and nitrogen, a chemical composition as specified in Table 1, material properties as specified in Table 2, and otherwise conforming to the requirements of ASTM A 675 be used for ASME B31.1 construction?

Reply: It is the opinion of the Committee that the hot rolled bar material described in this Case may be used in welded and unwelded construction under the rules of ASME B31.1 provided the following additional requirements are met.

(a) The allowable stress values tabulated in Table 3 shall not be exceeded. The material shall not be used for design temperatures above or below those for which the allowable stress values are given in this Code Case.

(b) The material shall be limited to service application NPS 2 and smaller and supplied for manufacturer as round bar not exceeding 4 in. diameter.

(c) Separate welding procedures and performance qualifications shall be required for this material. The welding process shall be GTAW. The welding procedure qualification and performance qualification shall be conducted in accordance with the ASME Boiler and Pressure Vessel Code, Section IX.

(d) The material shall not be used for Boiler External Piping.

(e) The material described in this Inquiry is one of the highest tensile strength materials approved for use in ASME pressure component applications. The ASME materials data base has little fatigue data on these high strength materials. When calculating the allowable expansion stress range S_A using Eq. (1) in para. 102.3.2(C), the allowable stresses for A 106 Grade B shall be used. Further, fittings manufactured using this material shall be fatigue tested to assure comparable behavior with ASME materials to be used in installed assemblies.

(f) All applicable requirements of ASME B31.1 shall be met.

TABLE 1
CHEMICAL COMPOSITION
(Heat or Cast Analysis)

Element	Percent Weight
Carbon	0.19–0.26
Manganese	1.35–1.65
Phosphorus	0.040 max.
Sulfur	0.050 max.
Silicon	0.15–0.35
Vanadium	0.02–0.20
Aluminum	0.015–0.050
Nitrogen	0.03 max.

GENERAL NOTE: Addition of elements intended to enhance machinability, such as lead, selenium, bismuth and tellurium, is not allowed.

TABLE 2
MINIMUM MECHANICAL PROPERTIES

Property	Value
Tensile Strength	110 ksi
Yield Strength (0.2% offset)	80 ksi min.
Elongation (in 2 in.)	15% min.

TABLE 3
ALLOWABLE STRESS VALUES

For Metal Temperature Not Exceeding, °F	Maximum Stress Value, ksi
−20 to 650	23.8

GENERAL NOTE: The allowable stress value is based on a tensile strength value of 95 ksi.

B31 CASE 165
Use of Alloy S32550 (25.5Cr–5.5Ni–3.5Mo–Cu), P-No. 10H in ASME B31.1 Construction

Approval Date: July 1995
Reaffirmation Date: July 1998

This Case shall expire on July 31, 2001, unless previously annulled or reaffirmed

Inquiry: May Alloy S32550 (25.5Cr–5.5Ni–3.5Mo–Cu), P-No. 10H, be used in power piping applications constructed in accordance with the B31.1 Code at temperatures up to and including 500°F?

Reply: Alloy S32550 may be used for ASME B31.1 construction to the specifications noted in this Code Case provided that all of the following requirements are met.

(a) THESE MATERIALS ARE NOT ACCEPTABLE FOR USE ON BOILER EXTERNAL PIPING — SEE PARA. 100.1.2.

(b) All applicable requirements of ASME B31.1 shall be met.

(c) Allowable stress values shown in Table 1 shall not be exceeded. These materials shall not be used at temperatures above those for which allowable stress values are given in this Code Case.

(d) All openings 4 in. and larger shall conform to para. 127.4.8 except that full penetration welds shall be used and separate reinforcing pads shall not be used.

(e) Butt weld joints shall be examined radiographically for their full length as prescribed in para. 136.4.5 when the wall thickness at the weld joint exceeds $1\frac{1}{2}$ in.

(f) Branch connection welds shall be radiographically (para. 136.4.5) or U.T. (para. 136.4.6) examined. See Table 136.4 when the size of the branch exceeds NPS 4.

(g) All welds where material thickness exceeds $\frac{3}{4}$ in. shall be examined by the liquid penetrant method.

(h) Pipe under external pressure shall meet requirements of para. 104.1.3.

(i) Heat treatment of product form is neither required nor prohibited but if performed shall be done in accordance with respective product specifications. See Table 132.

(j) Charpy impact testing shall be done in accordance with requirements of UHA-51(c)(2) when material wall thickness is greater than $\frac{3}{8}$ in.

TABLE 1

Spec. No.	Notes	Specified Minimum Tensile, ksi	Maximum Allowable Stress Values in Tension, ksi, for Metal Temperature up to and Including 500°F. [Note (1)]				
			-20 to 100	200	300	400	500
Seamless Pipe and Tube							
A789	...	110	27.5	27.4	25.7	24.7	24.7
A790	...	110	27.5	27.4	25.7	24.7	24.7
Welded Pipe and Tube							
A789	(2)	110	23.4	23.3	21.9	21.0	21.0
A790	(2)	110	23.4	23.3	21.9	21.0	21.0
Plate							
A240	...	110	27.5	27.4	25.7	24.7	24.7
Bar							
A479	...	110	27.5	27.4	25.7	24.7	24.7

NOTES:
(1) This steel may be expected to develop embrittlement after exposure to temperatures above 500°F for prolonged times. See ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, UHA-109.
(2) A factor of 0.85 has been applied in arriving at the maximum allowable stress values in tension for this material. Divide tabulated values by 0.85 for maximum allowable longitudinal tensile stress.

B31 CASE 168
Use of Ultrasonic Examination in Lieu of Radiography for B31.1 Application

Approval Date: June 1997

This Case shall expire on June 30, 2000, unless previously annulled or reaffirmed

Inquiry: Under what conditions and limitations may an ultrasonic examination be used in lieu of radiography, when radiography is required in accordance with Table 136.4?

Reply: It is the opinion of this Committee that welds in pressure piping governed by the ASME B31.1 Code may be examined using the ultrasonic (UT) method in lieu of radiography (RT) at any time provided that all of the following requirements are met.

(a) The weld is greater than $\frac{1}{2}$ in. in thickness.

(b) The ultrasonic examination is performed using an ultrasonic system capable of recording the ultrasonic examination data, including scanning positions, to facilitate the analysis of the scan data by a third party and the repeatability of subsequent examinations, should they be required.

(c) Personnel performing and evaluating UT examinations shall be qualified and certified in accordance with their employer's written practice. Recommended Practice SNT-TC-1A, Personnel Qualification and Certification in Nondestructive Testing, shall be used as a guideline for employers to establish a written practice for qualifying and certifying personnel.

(d) In addition, personnel collecting and analyzing UT data shall have demonstrated their ability to perform an acceptable examination using test blocks approved by the Owner.

(e) Welds that are shown by ultrasonic examination to have discontinuities which produce an indication greater than 20% of the reference level shall be investigated to the extent that ultrasonic examination personnel can determine their shape, identity, and location so that they may evaluate each discontinuity for acceptance in accordance with (1) and (2) below.

(1) Discontinuities evaluated as being cracks, lack of fusion, or incomplete penetration are unacceptable regardless of length.

(2) Other discontinuities are unacceptable if the indication exceeds the reference level and their length exceeds the following:

(a) $\frac{1}{4}$ in. (6.0 mm) for t up to $\frac{3}{4}$ in. (19.0 mm)

(b) $\frac{1}{3}t$ for t from $\frac{3}{4}$ in. (19.0 mm) to $2\frac{1}{4}$ in. (57.0 mm)

(c) $\frac{3}{4}$ in. (19.0 mm) for t over $2\frac{1}{4}$ in. (57.0 mm)

where t is the thickness of the weld being examined. If the weld joins two members having different thicknesses at the weld, t is the thinner of these two thicknesses.