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ASME Boiler & Pressure Vessel Code 2023

HSB - Global Inspection and Engineering Services

Presented by: Codes & Standards

ASME SETTING THE STANDARD | HSB | 50 Years | BSB EDGE

ASME Boiler & Pressure Vessel Code 2023

AGENDA

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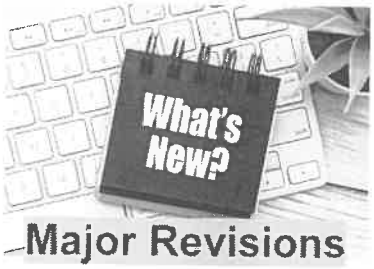
- Section I
- Section II
- Section V
- Section VIII
- Section IX



Major Revisions


Code Cases


Interpretations

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Section I Major Revisions

HSB - Global Inspections and Engineering Services

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3

PG-27.4.6, y factor

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PG-27.4.6

y = a coefficient having values as follows:

	Temperature, °F (°C)							
	900 (480) and Below	950 (510)	1,000 (540)	1,050 (565)	1,100 (595)	1,150 (620)	1,200 (650)	1,250 (675) and Above
Ferritic	0.4	0.5	0.7	0.7	0.7	0.7	0.7	0.7
Austenitic	0.4	0.4	0.4	0.4	0.5	0.7	0.7	0.7
Alloy B30, 801	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.7
N08811	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.7
825	0.4	0.4	0.4	...	...	...	...	...
N06230	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.7
N06022	0.4	0.4	0.4	0.4	0.5	0.7	0.7	0.7
N06025	0.4	0.4	0.4	0.4	0.5	0.7	0.7	0.7
N06045	0.4	0.4	0.4	0.4	0.5	0.7	0.7	0.7
N06600	0.4	0.4	0.4	0.4	0.5	0.7	0.7	...
N06601	0.4	0.4	0.4	0.4	0.5	0.7	0.7	...
N06625	0.4	0.4	0.4	0.4	0.4	...	...	...
N06690	0.4	0.4	0.4	0.4	0.5	0.7	0.7	...
Alloy 617	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.7
S31803	0.4	...	...	...	...	...	...	...

Values of y between temperatures listed may be determined by interpolation. For nonferrous materials not listed, y = 0.4.

Record 20-2785 (Public Review Draft)

PG-27.4.6

y = a coefficient having values as follows:

	y		
T_{TD}	y = 0.4	y = 0.5	y = 0.7
$T_{TD} \le 900°F$ (480°C)	DT ≤ 900°F (480°C)	DT = 950°F (510°C)	DT ≥ 1000°F (540°C)
$T_{TD} > 900°F$ (480°C)	DT ≤ T_{TD}	DT = T_{TD} + 50°F (28°C)	DT ≥ T_{TD} + 100°F (56°C)

NOTES:

1. DT = design temperature
2. T_{TD} = the lowest temperature value listed in the maximum allowable stress tables from ASME Section II Part D [see NOTES – TIME–DEPENDENT PROPERTIES] at which the allowable stress values are obtained from time-dependent properties.
3. Values of y between temperatures listed may be determined by interpolation.

4

PG-27.4.6, y factor

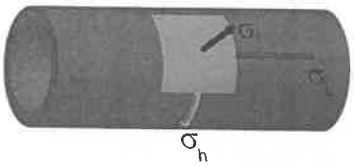
ASME Section I, 2021 Edition

PG-27.2.2 Piping, Drums, Shells, and Headers. Based on strength of weakest course.

$$t = \frac{PD}{2SE + 2yP} + C \quad \text{or} \quad \frac{PR}{SE - (1 - y)P} + C$$

$$P = \frac{2SE(t - C)}{D - 2y(t - C)} \quad \text{or} \quad \frac{SE(t - C)}{R + (1 - y)(t - C)}$$

See PG-27.4.1, PG-27.4.3, and PG-27.4.5 through PG-27.4.8.



$$\sigma_h = \frac{PR}{t}$$

PG-27.3 Symbols. Symbols used in the preceding equations are defined as follows:

- C = minimum allowance for threading and structural stability (see PG-27.4.3)
- D = outside diameter of cylinder
- E = efficiency (see PG-27.4.1)
- e = thickness factor for expanded tube ends (see PG-27.4.4)
- P = maximum allowable working pressure (see PG-21)
- R = inside radius of cylinder: for pipe, the inside radius is determined by the outside radius minus the nominal wall thickness
- S = maximum allowable stress value at the design temperature of the metal, as listed in the tables specified in PG-23 (see PG-27.4.2)

5

PG-27.4.6, y factor
Example 1, SA-106 Gr. B

ASME Section II, Part D, 2021 Edition

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, S, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	Carbon steel	Forgings	SA-765	I	K03046	...	...	1	1
2	Carbon steel	Plate	SA-515	60	K02401	...	...	1	1
3	Carbon steel	Plate	SA-516	60	K02100	...	...	1	1
4	Carbon steel	Wld. pipe	SA-671	CB60	K02401	...	...	1	1
5	Carbon steel	Wld. pipe	SA-671	CC60	K02100	...	...	1	1
6	Carbon steel	Wld. pipe	SA-671	CE60	K02402	...	...	1	1
7	Carbon steel	Wld. pipe	SA-672	B60	K02401	...	...	1	1
8	Carbon steel	Wld. pipe	SA-672	C60	K02100	...	...	1	1
9	Carbon steel	Wld. pipe	SA-672	E60	K02402	...	...	1	1
10	Carbon steel	Wld. pipe	SA-134	A283D	K02702	...	...	1	1
11	Carbon steel	Plate	SA-283	D	K02702	...	...	1	1
12	Carbon steel	Wld. pipe	SA-53	E/B	K03005	...	...	1	1
13	Carbon steel	Wld. pipe	SA-53	E/B	K03005	...	...	1	1
14	Carbon steel	Smls. pipe	SA-53	S/B	K03005	...	...	1	1
15	Carbon steel	Smls. pipe	SA-53	S/B	K03005	...	...	1	1
16	Carbon steel	Smls. pipe	SA-106	B	K03006	...	...	1	1
17	Carbon steel	Wld. pipe	SA-135	B	...	...	...	1	1
18	Carbon steel	Smls. & wld. fittings	SA-234	WPB	K03006	...	...	1	1
19	Carbon steel	Smls. & wld. pipe	SA-333	6	K03006	...	...	1	1
20	Carbon steel	Wld. pipe	SA-333	6	K03006	...	...	1	1
21	Carbon steel	Smls. & wld. tube	SA-334	6	K03006	...	...	1	1
22	Carbon steel	Wld. tube	SA-334	6	K03006	...	...	1	1

6

PG-27.4.6, y factor
Example 1, SA-106 Gr. B

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ASME Section II, Part D, 2021 Edition

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	60	30	NP	NP	1000	650	CS-2	G10, T2
2	60	32	1000	700	1000	650	CS-2	G10, S1, T2
3	66	32	850	700	1000	650	CS-2	G10, S1, T2
4	60	32	NP	700	NP	NP	CS-2	S6, W10, W12
5	60	32	NP	700	NP	NP	CS-2	S6, W10, W12
6	60	32	NP	700	NP	NP	CS-2	S6, W10, W12
7	60	32	NP	700	NP	NP	CS-2	S6, W10, W12
8	60	32	NP	700	NP	NP	CS-2	S6, W10, W12
9	60	32	NP	700	NP	NP	CS-2	S6, W10, W12
10	60	33	NP	300 (Cl. 3 only)	NP	NP	CS-2	W12
11	60	33	NP	300 (Cl. 3 only)	650	650	CS-2	
12	60	35	900	300 (Cl. 3 only)	NP	NP	CS-2	G10, S1, T1, W12, W13
13	60	35	900	NP	900	650	CS-2	G4, G10, G24, S1, T1, W6
14	60	35	900	350 (Cl. 3 only)	NP	NP	CS-2	G10, S1, T1
15	60	35	NP	700 (SPT)	900	650	CS-2	G10, T1
16	60	35	1000	700	1000	650	CS-2	G10, S1, T1
17	60	35	700	700	1000	650	CS-2	G10, S1, T1
18	60	35	1000	700	1000	650	CS-2	G10, S1, T1
19	60	35	700	700	1000	650	CS-2	G10, T1, W12, W13, W14
20	60	35	700	NP	NP	NP	CS-2	T1

NOTES - TIME-DEPENDENT PROPERTIES (See General Note (f))
T1 Allowable stresses for temperatures of 700°F and above are values obtained from time-dependent properties.
T2 Allowable stresses for temperatures of 850°F and above are values obtained from time-dependent properties.
T3 Allowable stresses for temperatures of 850°F and above are values obtained from time-dependent properties.
T4 Allowable stresses for temperatures of 900°F and above are values obtained from time-dependent properties.
T5 Allowable stresses for temperatures of 950°F and above are values obtained from time-dependent properties.

7

PG-27.4.6, y factor
Example 1, SA-106 Gr. B

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ASME Section II, Part D, 2021 Edition

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi) for Metal Temperature, °F, Not Exceeding 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	17.1	17.1	17.1	...	17.1	17.1	16.3	15.3	14.8	14.2	13.0	10.8	8.7	5.9
2	17.1	17.1	17.1	...	17.1	17.1	17.1	16.4	15.8	15.3	13.0	10.8	8.7	5.9
3	17.1	17.1	17.1	...	17.1	17.1	17.1	16.4	15.8	15.3	13.0	10.8	8.7	5.9
4	17.1	...	17.1	...	17.1	17.1	17.1	16.4	15.8	15.3	13.0	10.8	8.7	5.9
5	17.1	...	17.1	...	17.1	17.1	17.1	16.4	15.8	15.3	...	...	...	...
6	17.1	...	17.1	...	17.1	17.1	17.1	16.4	15.8	15.3	...	...	...	...
7	17.1	...	17.1	...	17.1	17.1	17.1	16.4	15.8	15.3	...	...	...	...
8	17.1	...	17.1	...	17.1	17.1	17.1	16.4	15.8	15.3	...	...	...	...
9	17.1	...	17.1	...	17.1	17.1	17.1	16.4	15.8	15.3	...	...	...	...
10	17.1	...	17.1	...	17.1	...	...	...	...	...	...	...	...	...
11	17.1	17.1	17.1	...	17.1	17.1	17.1	16.9	16.3	...	...	...	...	...
12	17.1	...	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	13.0	10.8	8.7	5.9
13	14.6	14.6	14.6	...	14.6	14.6	14.6	14.6	14.6	14.3	11.1	8.2	7.4	5.0
14	17.1	...	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	13.0	10.8	8.7	5.9
15	17.1	17.1	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	13.0	10.8	8.7	5.9
16	17.1	17.1	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	13.0	10.8	8.7	5.9
17	17.1	17.1	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	13.0	10.8	8.7	5.9
18	17.1	17.1	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	13.0	10.8	8.7	5.9
19	17.1	17.1	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	13.0	10.8	8.7	5.9
20	14.6	14.6	14.6	...	14.6	14.6	14.6	14.6	14.6	13.3	...	...	...	...
21	17.1	...	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	...	...	...	...
22	14.6	14.6	14.6	...	14.6	14.6	14.6	14.6	14.6	14.6	...	...	...	...
23	17.1	...	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	13.0	10.8	8.7	5.9
24	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	...	...	...	...	...
25	17.1	17.1	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	13.0	10.8	8.7	5.9
26	17.1	17.1	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	13.0	10.8	8.7	...

Although at **700°F**, the allowable stress becomes time dependent (see ***15.6 italicized***), **y factor is still 0.4** until the design temperature is equal or less than 900°F.

8

PG-27.4.6, y factor
Example 1, SA-106 Gr. B

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ASME Section II, Part D, 2021 Edition

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, S, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi) for Metal Temperature, °F, Not Exceeding													
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
1	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
2	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
3	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
19	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

If the design temperature is **950°F**, y factor is **0.5.**

If the design temperature is **1000°F**, y factor is **0.7.**

G10 : Upon prolonged exposure to temperatures above 800°F, the carbide phase of carbon steel may be converted to graphite.
See Nonmandatory Appendix A, A–201 and A–202.

9

PG-27.4.6, y factor
Example 2, SA-335 Gr.P22

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ASME Section II, Part D, 2021 Edition

31	1¼Cr–½Mo–Si	Wld. pipe	SA-691	1¼CR	K11789	...	...	4	1
32	1¼Cr–½Mo–Cu	Forgings	SA-592	E	K11695	...	$2\frac{1}{2} < t \leq 4$	11B	2
33	1¼Cr–½Mo–Cu	Forgings	SA-592	E	K11695	...	$\leq 2\frac{1}{2}$	11B	2
34	1¾Cr–½Mo–Ti	Plate	SA-517	E	K21604	...	$2\frac{1}{2} < t \leq 6$	11B	2
35	1¾Cr–½Mo–Ti	Plate	SA-517	E	K21604	...	$\leq 2\frac{1}{2}$	11B	2
36	2¼Cr–1Mo	Forgings	SA-182	F22	K21590	1	...	5A	1
37	2¼Cr–1Mo	Smls. tube	SA-213	T22	K21590	...	...	5A	1
38	2¼Cr–1Mo	Smls. & wld. fittings	SA-234	WP22	K21590	1	...	5A	1
39	2¼Cr–1Mo	Wld. tube	SA-250	T22	K21590	...	...	5A	1
40	2¼Cr–1Mo	Wld. tube	SA-250	T22S1	K21590	...	...	5A	1
41	2¼Cr–1Mo	Smls. pipe	SA-335	P22	K21590	...	...	5A	1
42	2¼Cr–1Mo	Forgings	SA-336	F22	K21590	1	...	5A	1
43	2¼Cr–1Mo	Forged pipe	SA-369	FP22	K21590	...	...	5A	1
44	2¼Cr–1Mo	Plate	SA-387	22	K21590	1	...	5A	1
45	2¼Cr–1Mo	Wld. pipe	SA-691	2¼CR	K21590	...	...	5A	1

10

PG-27.4.6, y factor

Example 2, SA-335 Gr.P22

ASME Section II, Part D, 2021 Edition

36	60	30	1200	700	1200	NP	CS-2	S4, T4, W7, W9
37	60	30	1200	700	1200	NP	CS-2	S4, T4, W7, W9
38	60	30	1200	700	1200	NP	CS-2	S4, T4, W7, W14
39	60	30	1200	NP	NP	NP	CS-2	G3, S4, T4, W9
40	60	30	1200	NP	NP	NP	CS-2	S4, T4, W9, W13
41	60	30	1200	700	1200	NP	CS-2	S4, T4, W7, W9
42	60	30	1200	700	1200	NP	CS-2	S4, T4, W7, W9
43	60	30	1200	700	1200	NP	CS-2	S4, T4, W7, W9
44	60	30	1200	700	1200	NP	CS-2	S4, T4, W7, W9
45	60	30	NP	700	NP	NP	CS-2	G26, W10, W12

NOTES – TIME-DEPENDENT PROPERTIES (See General Note (f))

T1 Allowable stresses for temperatures of 700°F and above are values obtained from time-dependent properties.
T2 Allowable stresses for temperatures of 750°F and above are values obtained from time-dependent properties.
T3 Allowable stresses for temperatures of 850°F and above are values obtained from time-dependent properties.
T4 Allowable stresses for temperatures of 900°F and above are values obtained from time-dependent properties.
T5 Allowable stresses for temperatures of 950°F and above are values obtained from time-dependent properties.
T6 Allowable stresses for temperatures of 1000°F and above are values obtained from time-dependent properties.
T7 Allowable stresses for temperatures of 1050°F and above are values obtained from time-dependent properties.
T8 Allowable stresses for temperatures of 1100°F and above are values obtained from time-dependent properties.
T9 Allowable stresses for temperatures of 1150°F and above are values obtained from time-dependent properties.
T10 Allowable stresses for temperatures of 800°F and above are values obtained from time-dependent properties.
T11 Allowable stresses for temperatures of 650°F and above are values obtained from time-dependent properties.

11

PG-27.4.6, y factor

Example 2, SA-335 Gr.P22

ASME Section II, Part D, 2021 Edition

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line	Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
No.	100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	18.2	...	18.0	...	17.5	17.4	17.4	17.4	17.4	17.4	17.4	17.4	17.3	16.9
2	18.2	...	18.2	...	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	17.7	17.0
3	18.2	...	18.0	...	17.5	17.4	17.4	17.4	17.4	17.4	17.4	17.4	17.3	16.9
41	17.1	17.1	17.1	...	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	*13.6*
42	17.1	17.1	17.1	...	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	*13.6*
43	17.1	17.1	17.1	...	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	*13.6*
44	17.1	...	17.1	...	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	*13.6*
45	17.1	...	17.1	...	16.6	16.6	16.6	16.6	16.6	16.6	...	...	...	...

At **900°F**, the allowable stress becomes time dependent (see ***13.6 italicized***), **y factor is still 0.4** if the design temperature is equal or less than 900°F.

12

PG-27.4.6, y factor

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PG-27.4.6

y = a coefficient having values as follows:

	Temperature, °F (°C)							
	900 (480) and Below	950 (510)	1,000 (540)	1,050 (565)	1,100 (595)	1,150 (620)	1,200 (650)	1,250 (675) and Above
Ferritic	0.4	0.5	0.7	0.7	0.7	0.7	0.7	0.7
Austenitic	0.4	0.4	0.4	0.4	0.5	0.7	0.7	0.7
Alloy 800, 801	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.7
UNS N08811	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.7
825	0.4	0.4	0.4	...	...	...	...	...
N06230	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.7
N06022	0.4	0.4	0.4	0.4	0.5	0.7	0.7	0.7
N06025	0.4	0.4	0.4	0.4	0.5	0.7	0.7	0.7
N06045	0.4	0.4	0.4	0.4	0.5	0.7	0.7	0.7
N06600	0.4	0.4	0.4	0.4	0.5	0.7	0.7	...
N06601	0.4	0.4	0.4	0.4	0.5	0.7	0.7	...
N06625	0.4	0.4	0.4	0.4	0.4	...	...	...
N06690	0.4	0.4	0.4	0.4	0.5	0.7	0.7	...
Alloy 617	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.7
S31803	0.4	...	...	...	...	...	...	...

Values of y between temperatures listed may be determined by interpolation. For nonferrous materials not listed, y = 0.4.

Record 20-2785 (Public Review Draft)

PG-27.4.6

y = a coefficient having values as follows:

	y		
T_{TD}	y = 0.4	y = 0.5	y = 0.7
T_{TD} ≤ 900°F (480°C)	DT ≤ 900°F (480°C)	DT = 950°F (510°C)	DT ≥ 1000°F (540°C)
T_{TD} > 900°F (480°C)	DT ≤ T_{TD}	DT = T_{TD} + 50°F (28°C)	DT ≥ T_{TD} + 100°F (56°C)

NOTES:

1. DT = design temperature
2. T_{TD} = the lowest temperature value listed in the maximum allowable stress tables from ASME Section II Part D [see NOTES – TIME–DEPENDENT PROPERTIES] at which the allowable stress values are obtained from time-dependent properties.
3. Values of y between temperatures listed may be determined by interpolation.

13

PG-27.4.6, y factor

Example 2, SA-335 Gr.P22

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ASME Section II, Part D, 2021 Edition

If the design temperature is ***950°F***, **y factor is 0.5.**

If the design temperature is ***1000°F*** or higher, **y factor is 0.7.**

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, S, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
1	11.3	7.2	4.5	2.8	1.8	1.1	...	...	...	...	...	...	...	...	...
2	11.3	7.2	4.5	2.8	1.9	1.2	...	...	...	...	...	...	...	...	...
3	11.3	7.2	4.5	2.8	1.8	1.1	...	...	...	...	...	...	...	...	...
41	10.8	8.0	5.7	3.8	2.4	1.4	...	...	...	...	...	...	...	...	...
43	10.8	8.0	5.7	3.8	2.4	1.4	...	...	...	...	...	...	...	...	...
44	10.8	8.0	5.7	3.8	2.4	1.4	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

14

PG-27.4.6, y factor
Example 3, SA-335 Gr.P91 Type 1

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ASME Section II, Part D, 2021 Edition

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, S, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	5Cr-½Mo	Smls. tube	SA-213	T5	K41545	...	...	5B	1
2	5Cr-½Mo	Smls. & wld. fittings	SA-234	WP5	K41545	...	...	5B	1
3	5Cr-½Mo	Smls. pipe	SA-335	P5	K41545			5B	1
(21) 26	9Cr-1Mo-V	Smls. tube	SA-213	T91 Type 1	K90901	...	...	15E	1
(21) 27	9Cr-1Mo-V	Fittings	SA-234	WP91 Type 1	K90901	...	...	15E	1
(21) 28	9Cr-1Mo-V	Smls. pipe	SA-335	P91 Type 1	K90901	...	$t \le 3$	15E	1
(21) 29	9Cr-1Mo-V	Smls. pipe	SA-335	P91 Type 1	K90901	...	$t > 3$	15E	1
(21) 30	9Cr-1Mo-V	Forged pipe	SA-369	FP91 Type 1	K90901	...	...	15E	1

15

PG-27.4.6, y factor
Example 3, SA-335 Gr.P91 Type 1

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ASME Section II, Part D, 2021 Edition

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, S, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	60	30	1200	700	1200	NP	CS-2	T4
2	60	30	1200	700	1200	NP	CS-2	T4, W14
3	60	30	1200	700	1200	NP	CS-2	T4
26	85	60	1200	700	1200	NP	CS-3	T6
27	90	60	1200	NP	NP	NP	CS-3	T6
28	85	60	1200	700	1200	NP	CS-3	T6
29	85	60	1200	NP	1200	NP	CS-3	T6
30	85	60	1200	NP	NP	NP	CS-3	T6

T6 Allowable stresses for temperatures of 1000°F and above are values obtained from time–dependent properties.

16

PG-27.4.6, y factor
Example 3, SA-335 Gr.P91 Type 1

ASME Section II, Part D, 2021 Edition

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	17.1	...	17.1	...	16.6	16.5	16.4	16.2	15.9	15.6	15.1	14.5	13.8	*10.9*
2	17.1	...	17.1	...	16.6	16.5	16.4	16.2	15.9	15.6	15.1	14.5	13.8	*10.9*
3	17.1	...	17.1	...	16.6	16.5	16.4	16.2	15.9	15.6	15.1	14.5	13.8	*10.9*
4	17.1	...	17.1	...	16.6	16.5	16.4	16.2	15.9	15.6	15.1	14.5	13.8	*10.9*
5	17.1	...	17.1	...	16.6	16.5	16.4	16.2	15.9	15.6	15.1	14.5	13.8	*10.9*
26	24.3	...	24.3	...	24.3	24.2	24.1	23.7	23.4	22.9	22.2	21.3	20.3	19.1
27	25.7	...	25.7	...	25.7	25.6	25.5	25.1	24.7	24.2	23.5	22.6	21.5	20.2
28	24.3	...	24.3	...	24.3	24.2	24.1	23.7	23.4	22.9	22.2	21.3	20.3	19.1
29	24.3	...	24.3	...	24.3	24.2	24.1	23.7	23.4	22.9	22.2	21.3	20.3	19.1
30	24.3	...	24.3	...	24.3	24.2	24.1	23.7	23.4	22.9	22.2	21.3	20.3	19.1
31	24.3	...	24.3	...	24.3	24.2	24.1	23.7	23.4	22.9	22.2	21.3	20.3	19.1

17

PG-27.4.6, y factor
Example 3, SA-335 Gr.P91 Type 1

ASME Section II, Part D, 2021 Edition

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
1	*8.0*	*5.8*	*4.2*	*2.9*	*1.8*	*1.0*	...	...	...	...	...	...	...	...	...
2	*8.0*	*5.8*	*4.2*	*2.9*	*1.8*	*1.0*	...	...	...	...	...	...	...	...	...
3	*8.0*	*5.8*	*4.2*	*2.9*	*1.8*	*1.0*	...	...	...	...	...	...	...	...	...
4	*8.0*	*5.8*	*4.2*	*2.9*	*1.8*	*1.0*	...	...	...	...	...	...	...	...	...
5	*8.0*	*5.8*	*4.2*	*2.9*	*1.8*	*1.0*	...	...	...	...	...	...	...	...	...
26	17.8	16.1	12.2	8.7	5.7	3.5	...	...	...	...	...	...	...	...	... (21)
27	18.8	16.1	12.2	8.7	5.7	3.5	...	...	...	...	...	...	...	...	... (21)
28	17.8	16.1	12.2	8.7	5.7	3.5	...	...	...	...	...	...	...	...	... (21)
29	17.8	16.1	12.2	8.7	5.7	3.5	...	...	...	...	...	...	...	...	... (21)
30	17.8	16.1	12.2	8.7	5.7	3.5	...	...	...	...	...	...	...	...	... (21)

18

PG-27.4.6, y factor

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PG-27.4.6

y = a coefficient having values as follows:

	Temperature, °F (°C)							
	900 (480) and Below	950 (510)	1,000 (540)	1,050 (565)	1,100 (595)	1,150 (620)	1,200 (650)	1,250 (675) and Above
Ferritic	0.4	0.5	0.7	0.7	0.7	0.7	0.7	0.7
Austenitic	0.4	0.4	0.4	0.4	0.5	0.7	0.7	0.7
Alloy 800, 800H, N08811; 825	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.7
N06230	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.7
N06022	0.4	0.4	0.5	0.5	0.5	0.7	0.7	0.7
N06625	0.4	0.4	0.5	0.5	0.5	0.7	0.7	0.7
N06845	0.4	0.5	0.5	0.5	0.5	0.7	0.7	0.7
N06600	0.4	0.4	0.4	0.4	0.5	0.7	0.7	...
N06601	0.4	0.4	0.4	0.4	0.5	0.7	0.7	...
N06625	0.4	0.4	0.4	0.4	0.4	...	...	...
N06690	0.4	0.4	0.4	0.4	0.5	0.7	0.7	...
Alloy 617	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.7
S31803	0.4	...	...	...	...	...	...	...

Values of y between temperatures listed may be determined by interpolation. For nonferrous materials not listed, y = 0.4.

Record 20-2785 (Public Review Draft)

PG-27.4.6

y = a coefficient having values as follows:

	y		
T_{TD}	y = 0.4	y = 0.5	y = 0.7
T_{TD} ≤ 900°F (480°C)	DT ≤ 900°F (480°C)	DT = 950°F (510°C)	DT ≥ 1000°F (540°C)
T_{TD} > 900°F (480°C)	DT ≤ T_{TD}	DT = T_{TD} + 50°F (28°C)	DT ≥ T_{TD} + 100°F (56°C)

NOTES:

1. DT = design temperature
2. T_{TD} = the lowest temperature value listed in the maximum allowable stress tables from ASME Section II Part D [see NOTES – TIME–DEPENDENT PROPERTIES] at which the allowable stress values are obtained from time-dependent properties.
3. Values of y between temperatures listed may be determined by interpolation.

19

PG-27.4.6, y factor
Example 3, SA-335 Gr.P91 Type 1

HSB

ASME Section II, Part D, 2021 Edition

If the design temperature is less than or equal to ***1000°F***, **y factor is 0.4.**

If the design temperature is ***1050°F***, **y factor is 0.5.**

If the design temperature is ***1100°F*** or higher, **y factor is 0.7.**

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding															
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650	
1	8.0	5.8	4.2	2.9	1.8	1.0	...	...	...	...	...	...	...	...	...	
2	8.0	5.8	4.2	2.9	1.8	1.0	...	...	...	...	...	...	...	...	...	
3	8.0	5.8	4.2	2.9	1.8	1.0	...	...	...	...	...	...	...	...	...	
4	8.0	5.8	4.2	2.9	1.8	1.0	...	...	...	...	...	...	...	...	...	
5	8.0	5.8	4.2	2.9	1.8	1.0	...	...	...	...	...	...	...	...	...	
26	17.8	16.1	12.2	8.7	5.7	3.5	...	...	...	...	...	...	...	...	...	(21)
27	18.8	16.1	12.2	8.7	5.7	3.5	...	...	...	...	...	...	...	...	...	(21)
28	17.8	16.1	12.2	8.7	5.7	3.5	...	...	...	...	...	...	...	...	...	(21)
29	17.8	16.1	12.2	8.7	5.7	3.5	...	...	...	...	...	...	...	...	...	(21)
30	17.8	16.1	12.2	8.7	5.7	3.5	...	...	...	...	...	...	...	...	...	(21)

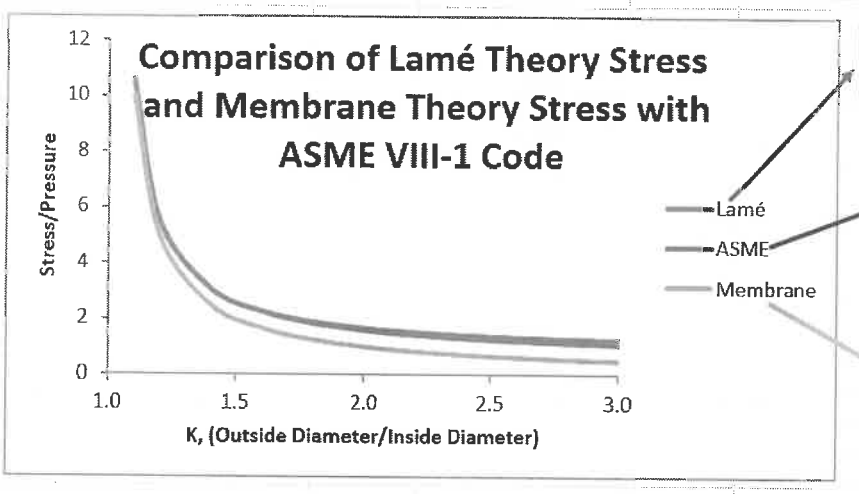
20

PG-27.4.6, y factor

y factor is introduced in Section I to take into account of the reduction of stress due to redistribution when the temperature is in the creep region.

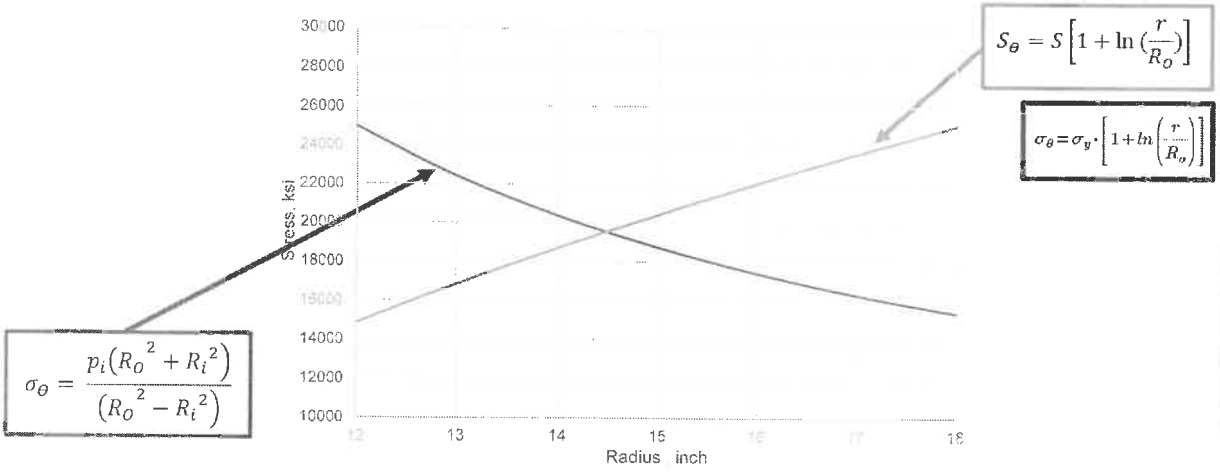
21

PG-27.4.6, y factor



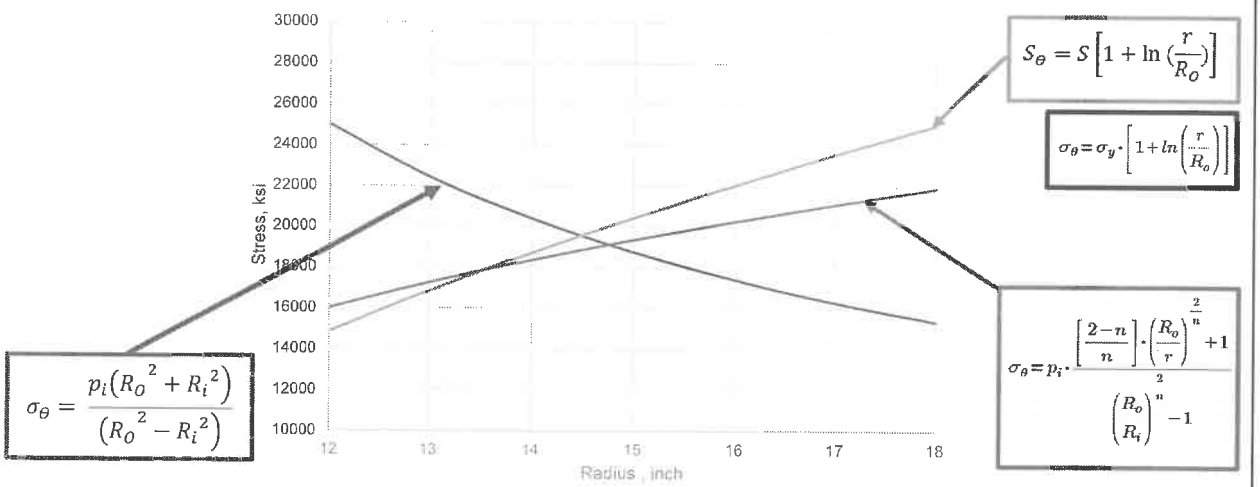
22

PG-27.4.6, y factor



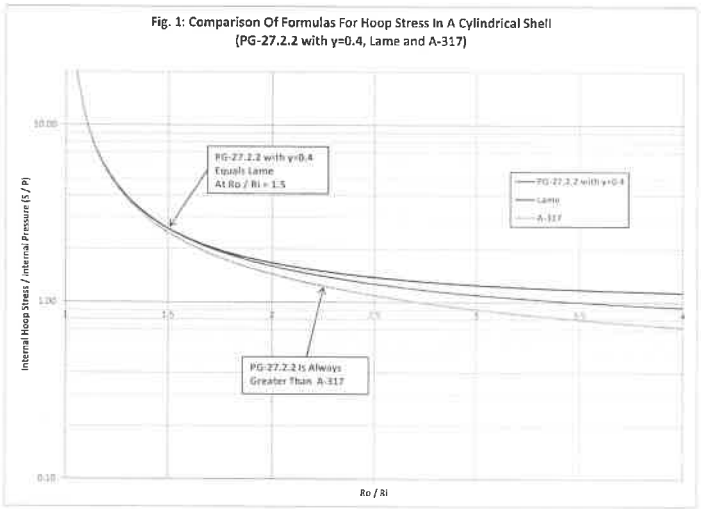
23

PG-27.4.6, y factor



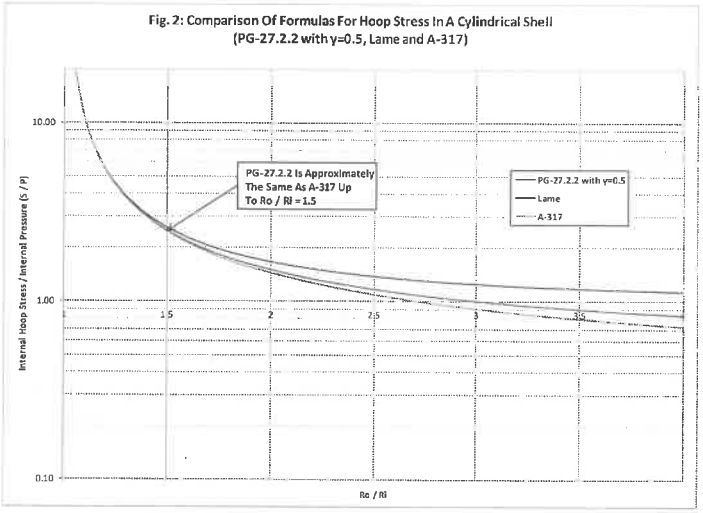
24

PG-27.4.6, y factor



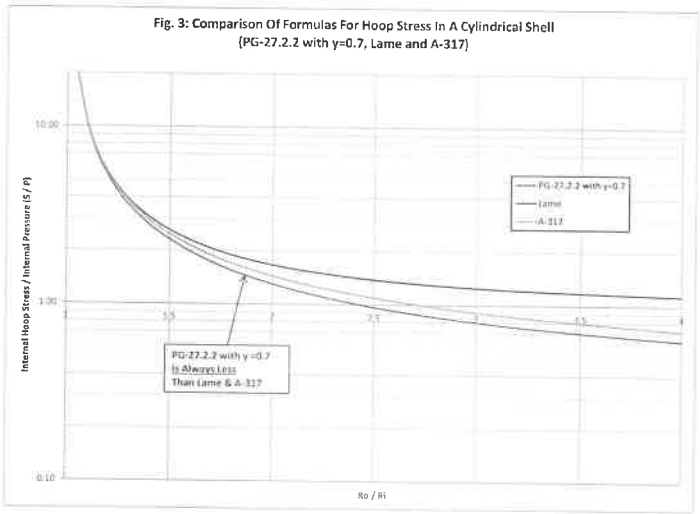
25

PG-27.4.6, y factor



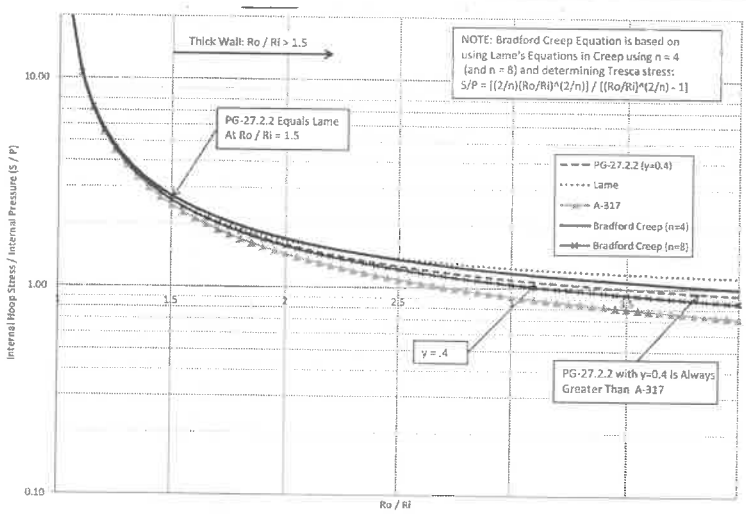
26

PG-27.4.6, y factor



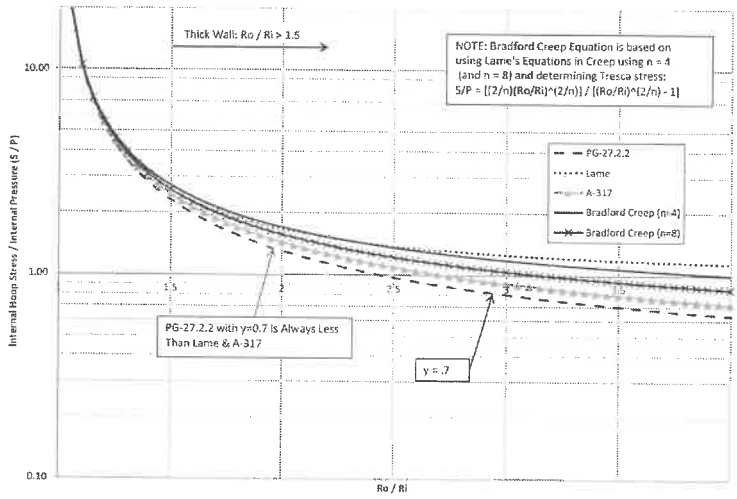
27

PG-27.4.6, y factor



28

PG-27.4.6, y factor



29

Marking requirements for products constructed to ASME product standard

ASME Section I, 2021 Edition

PG-11.3 Cast, Forged, Rolled, or Die-Formed Standard Pressure Parts, Either Welded or Nonwelded, That Comply With an ASME Product Standard.

PG-11.3.1 PG-11.3 applies to pressure parts such as pipe fittings, valves, flanges, nozzles, welding caps, manhole frames and covers, and pump casings that are a part of the boiler circulating system, that comply with an ASME product standard accepted by reference in PG-42 and are so marked. The ASME product standard establishes the basis for the pressure–temperature rating and marking unless modified in PG-42.

PG-11.3.2 Materials for standard pressure parts shall be either as permitted by this Section or as specifically listed in the ASME product standard.

PG-11.3.3 When welding is performed, in addition

PG-11.3.1 states that pipe fittings, valves, flanges, welding caps, etc. that comply with an ASME product standard accepted by reference in PG-42 are so marked.

It further states that The ASME product standard establishes the basis for the pressure–temperature rating **and marking unless modified in PG-42.**

30

Marking requirements for products constructed to ASME product standard

ASME Section I, 2021 Edition

ASME B16.11, Forged Fittings, Socket-Welding and Threaded (see PG-11.3)
ASME B16.15, Cast Copper Alloy Threaded Fittings, Classes 125 and 250 (see PG-8.4 and PG-42.4.1)
ASME B16.20, Metallic Gaskets for Pipe Flanges, Ring-Joint, Spiral-Wound, and Jacketed
ASME B16.24, Cast Copper Alloy Pipe Flanges and Flanged Fittings, Classes 150, 300, 600, 900, 1500, and 250
A
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ing
ASME B16.42, Ductile Iron Pipe Flanges and Flanged Fittings, Classes 150 and 300 (see PG-8.3)

PG-42.2 Marking. All valves and fittings shall be marked in accordance with the ASME product standard except that the pressure-rating marking may be omitted from:

tion VIII, Division 1, Figure 2-4, illustrations (12) and (12a).

PG-42.2 Marking. All valves and fittings shall be marked with the name, trademark, or other identification of the manufacturer and the primary service pressure rating except that the pressure-rating marking may be omitted from:

PG-42.2.1 Cast iron threaded fittings for Class 125 (PN 20) working pressure

PG-42.2.2 Malleable iron threaded fittings for Class 150 (PN 20) working pressure

PG-42.2.3 Nonferrous threaded fittings for Classes

Record 21-525

(Public Review Draft)

PG-42.2 does make a modification about the P-T ratings for certain fittings **but the opening sentence in PG-42.2 only makes reference to the name, trademark, or other identification of the manufacturer and the primary service pressure rating whereas the product standards require (also required by PG-11.3.1) additional marking such as size, material etc.**

31

PG-104, Code Certification, subcontracted work

ASME Section I, 2021 Edition

No Manufacturer or assembler may accept Code responsibility for work that falls within the scope of the Code, that is performed by workmen employed by any other organization, except through proper Code certification. The responsibilities set forth herein relate only to Code compliance and are not to be construed as involving contractual relations or legal liabilities.

NOTE:
(1) Boiler Manufacturer or Manufacturer as used in PG-104 or other paragraphs referenced to this Note may also be an Engineering-Contractor organization with or without fabricating facilities, but having the capability of providing a design specification that establishes the pressure and
ons for each component of a complete

The statement in the last paragraph of PG-104.1 "No Manufacturer or assembler may accept Code responsibility for work that falls within the scope of the Code, that is performed by workmen employed by any other organization, except through proper Code certification" may imply that all subcontracted work must be performed by certificate holders and they shall always document their work on a Section I data report.

However, PW-1.2 permits a certificate holder to perform welding using welders not in his employ provided the conditions in PW-1.2.1 through PW-1.2.5 are met. Additionally, Certificate Holders may also subcontract activities such as forming, NDE, PWHT, etc. without getting that work documented on a data report. **Certificate Holders take responsibility for the subcontracted work afterwards when they sign the relevant Section I data report.**

32

PG-104, Code Certification, subcontracted work

The last paragraph of PG-104.1 is revised in 2023 edition by clarifying that welding work can be subcontracted per the provisions of PG-11.5 or PW-1.2.

It is also clarified in PG-104.1 that other subcontracted work (forming, NDE, etc.) needs to follow the Manufacturers written Quality Assurance System.

33

PG-104 .1 Note (2), Documenting the hydrotest of the completed boiler when BEP is not provided by the boiler Manufacturer

ization, except through proper Code certification. The responsibilities set forth herein relate only to Code compliance and are not to be construed as involving contractual relations or legal liabilities.

NOTE:
(1) Boiler Manufacturer or M... other paragraphs refer... Engineering Contractor or... caring facilities, but having the capability of providing a design specification that establishes the pressure and temperature conditions for each component of a complete boiler unit and of assembling the fabricated parts in the field with authorization from the Society to use the Certification Mark with the "S" Designator in accordance with the Code provisions in PG-105.3.
(2) When boiler external piping within the scope of Section I is furnished by other than the boiler Manufacturer, the boiler Manufacturer is not responsible for the Code certification of such piping. The organizations that furnish and that install such external piping by welding shall furnish proper Code certification (PG-104.2) for such piping including Manufacturers' Data Report Form P-4A as required by PG-112.2.5 and PG-112.3.

either by welding or mechanical assembly

PG-104.2 Proper Code certification refers to the furnishing of stamping and Data Reports as evidence to establish the following:

PG-104.2.1 The organization that performed that portion of the work held an appropriate Certificate of Authorization.

PG-104.2.2 By signing and furnishing the appro-

boiler part to which a Certification Mark is to be applied shall be fabricated by a Manufacturer who is in possession of a Certificate of Authorization to use the Certification Mark with appropriate Designator.

PG-105.2 Application for Certificate of Authorization. Any organization desiring a Certificate of Authorization shall apply to the ASME in accordance with the certification process of ASME CA-1. Authorization to use Certification Marks may be granted, renewed, suspended, or withdrawn as specified in ASME CA-1.

PG-105.3 Designated Oversight. The Manufacturer or Assembler shall comply with the requirements of ASME CA-1 for Designated Oversight by use of an Authorized Inspection Agency or Certified Individual, as applicable.

PG-105.4 Quality Control System. Any Manufacturer or Assembler holding or applying for a Certificate of Authorization shall demonstrate a quality program that meets the requirements of ASME CA-1 and establishes that all Code requ... fabrication, exami... inspection for boile... Inspector) will be ... in accordance with ... Certificates of A... cate the scope of a... The Manufacture... quality program c... results subject to a...

The hydrostatic test of the completed boiler shall be documented on Form P-4A, Manufacturer's Data Report for Fabricated Piping.

Record 21-1380

(Public Review Draft)

- Form P-4B is deleted
- PG-112.2.5 is updated and going forward only Form P-4A will be used for both welded and mechanically assembled piping.

34

Revision of Form P-4 to include section when documenting BEP

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ASME Section I, 2021 Edition

(21) **PG-109 STAMPING OF PRESSURE PIPING**

PG-109.1 Boiler external piping, as defined in the Preamble, may be fabricated by a manufacturer other than the Manufacturer of the boiler, provided that the manufacturer has been issued a Certificate of Authorization to use the Certification Mark with the "S" or "PP" Designator. Boiler external piping may be installed by welding by a manufacturer or contractor other than the Manufacturer of the boiler, provided such an organization has been issued a Certificate of Authorization to use the Certification Mark with the "S," "PP," or "A" Designator. When boiler external piping is installed by welding, the welding, including the qualification of welding procedures, welders, and welding operators, shall be done in accordance with the applicable rules of ASME B31.1. The welding shall be inspected by an Authorized Inspector at such stages of the work as he may elect. The organizations that fabricate or install such piping shall furnish proper code certification (PG-104.2).

PG-109.1.1 When contracted for by the boiler Manufacturer, that piping shall be documented on Form P-4, Manufacturer's Partial Data Report, in accordance with PG-112.2.4.

PG-109.1.2 When contracted for by other than the boiler Manufacturer, that piping shall be documented on Form P-4A, Manufacturer's Data Report for Fabricated Piping, in accordance with PG-112.2.5.

New Section added to Form P-4 to document piping

Record 21-1403

(Public Review Draft)

12. Fabricated Piping

a. Identification (35) {Main steam, boiler feed, blow-off, or other service piping-state which}

b. Design Conditions of Piping (36) Pressure (34) Temperature

c. Description of Piping (include material identifications by ASME specification or other recognized Code designation) (37)

d. Shop Hydrostatic Test (44)

35

Section I, Review of CA-1-2020

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MANDATORY APPENDIX III
CRITERIA FOR REAPPLICATION OF A CERTIFICATION MARK

III-1 INTRODUCTION

After an item has been certified under ASME Section I, if the stamping of the Certification Mark with appropriate Designator becomes illegible or the nameplate is illegible or lost, but traceability to the original certification can be established, the Certification Mark may be reapplied to the item. For the purpose of this Mandatory Appendix, application of the Certification Mark with the appropriate Designator shall be equivalent to the Code Symbol stamping required by earlier Code editions and addenda.

III-2 CONDITIONS

Reapplication of the Certification Mark shall only be permitted under the following conditions:

(a) The Owner has requested the reapplication.

(b) Where applicable, the jurisdiction has granted the request for reapplication.

(c) The reapplication shall be performed by the original Manufacturer of the Code item. Where responsibility for the original Code certification has been maintained, reapplication by a successor organization to the original Manufacturer is permitted.

(d) The reapplication shall be authorized and witnessed by an Inspector from an ASME-accredited Authorized Inspection Agency, or by an authorized representative of the Qualified Inspection Organization or a Certified Individual, as applicable under the associated certification program.

(e) Reapplication of the Certification Mark shall be documented on a Certificate of Conformance for Reapplication of the Certification Mark as shown in Form III-1A. The completed Certificate of Conformance for Reapplication of the Certification Mark shall be retained as required for the original Manufacturer's Data Report.

III-3 RULES

Reapplication of the Certification Mark shall only be provided to restore evidence of original compliance with ASME Section I requirements. Reapplication of the Certification Mark shall not be applied for certification of the current condition of the item or for certification to different requirements than originally constructed.

Delete entire contents of Appendix III and replace with the following statement:

"Reapplication of the ASME Single Certification Mark shall be in accordance with ASME CA-1."

Record 20-2940 (Public Review Draft)

36

Section I, Review of CA-1-2020

Record 20-2940 (Public Review Draft)

(19)

MANDATORY APPENDIX VII
ALTERNATE METHODS FOR APPLYING THE ASME CERTIFICATION MARK

VII-1 REQUIREMENTS FOR ALTERNATE METHODS

Acceptable alternate methods include etching (laser, plasma, or chemical), peening, and engraving. The following requirements apply:

(a) The applied ASME Certification Mark shall be permanent, clearly legible, and identical in size and configuration to the ASME-issued stamp.

(b) The process controls for the method of marking shall be described in the Quality Control System and shall be acceptable to the Authorized Inspector.

(c) The external surface condition where the marking is to be applied shall be clean, uncoated, and unpainted.

Insert new paragraph (d), to read:

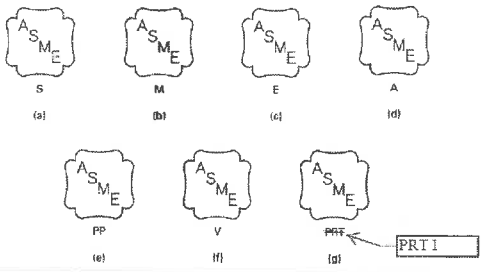
"(d) Additional provisions for alternative methods in applying the ASME Certification Mark shall be in accordance with ASME CA-1."

37

Section I, Review of CA-1-2020

Record 20-2940 (Public Review Draft)

Figure PG-105.1
Official Certification Mark to Denote the American Society of Mechanical Engineers' Standard for Boilers



Updated reference to the PRT I Designator in PG-105.1(g), Fig. PG-105.1(g), PG-106.8.1, and in Form P-4.

38

Section I, Clarity item for PW-26

Current Text	Proposed Text
PW-26 GENERAL The rules in the following paragraphs apply specifically to the fabrication of boilers and parts thereof that are fabricated by welding and shall be used in conjunction with the general requirements for fabrication in Part PG, as well as with the specific requirements for fabrication in the applicable Parts of this Section that pertain to the type of boiler under consideration.	**PW-26 GENERAL** The rules in this section apply to the manufacture of boilers and boiler parts fabricated by welding. They shall be used with the fabrication requirements in Part PG and other Parts of this Section for the specific boiler types under consideration. ~~in all or Parts of this Section.~~

Record 22-554(Public Review Draft)

	Before	After
Word Count	61	41
Paragraphs	1	1
Sentences	1	2
Sentences per paragraph	1	2
Words per sentence	61	20.5
Flesch-Kincaid Grade Level	29.2	11.9

- ***Several paragraphs are rewritten to improve clarity***
- ***Some paragraphs are modified to make them gender neutral***

39

Qualification of Weld Procedures by Multiple Organizations

- Section IX had introduced rules for Simultaneous Procedure Qualifications in 2021 edition under QG-106.4.
- This provision permits multiple organizations to supervise the welding of a single test coupon and potentially save the cost of procedure qualification provided that each organization accepts full responsibility for any such qualifications meeting the requirements of QG-106.4.
- ***QG-106.4 also states that the provisions of that paragraph applies only when expressly permitted by the referencing code.***

40

Qualification of Weld Procedures by Multiple Organizations

ASME Section IX, 2021 Edition

(21) **QG-106.4 Simultaneous Procedure Qualifications.** When expressly permitted by the referencing code, welding procedures may be simultaneously qualified by more than one organization, provided that each organization accepts full responsibility for any such qualifications and the following requirements are met:

(a) Each participating organization shall be represented by an individual with responsibility for qualification of joining procedures, as detailed in QG-106.

(b) A preliminary joining procedure specification acceptable to the representatives of each participating organization shall be prepared addressing the essential and nonessential variables and, when applicable, the supplementary essential variables and other requirements that are to be observed for each process to be used for joining the test coupon(s). If any variables are revised during the joining of a test coupon, the revised variables shall be agreed upon by the representatives of each participating organization.

(c) Joining of the test coupon(s) shall be conducted under the simultaneous supervision of the representatives of each participating organization.

(d) The PQR shall document that the qualification was conducted under the provisions of QG-106.4.

41

Qualification of Weld Procedures by Multiple Organizations

Section I has revised PW-28.1.3 in 2023 edition formally accepting Simultaneous Procedure Qualifications for Section I applications.

The Manufacturer's or Assembler's written quality control program shall address the requirements of Section IX QG-106.4.

42

Qualification of Weld Procedures by Multiple Organizations

Current Text	Proposed Text
PW-28.1.3 Welding of all test coupons shall be conducted by the Manufacturer. Testing of all test coupons shall be the responsibility of the Manufacturer. Qualification of a welding procedure, a welder, or a welding operator by one Manufacturer shall not qualify that procedure, welder, or the welding operator for any other Manufacturer except as provided in Section IX, QG-106.1 (c) and QG-106.2 (g).	**PW-28.1.3** Welding of all test coupons shall be conducted by the Manufacturer. Testing of all test coupons shall be the responsibility of the Manufacturer. Qualification of a welding procedure, a welder, or a welding operator by one Manufacturer shall not qualify that procedure, welder, or the welding operator for any other Manufacturer except as provided in Section IX, QG-106.1 (c) and QG-106.2 (g). *Welding procedures may be simultaneously qualified by more than one organization using the same as permitted in of Section IX QG-106.4, provided that each organization accepts full responsibility for any such qualifications and complies with the other requirements of Section IX for documentation of welding records. The Manufacturer's or Assembler's written quality control program shall include requirements for addressing the interrequirements of Section IX QG-106.4.*

Record 20-1055
(Public Review Draft)

43

Section I, PW-38.6 Preheat, Dissimilar Materials

When different P-Number materials [e.g., P-No 5A to a P-No 8] are joined by welding where one requires preheat above 50°F (10°C), and the other does not, the preheat need only be maintained on the side of the welded joint requiring the higher preheat.

The thickness of the base metal shall not exceed 5/8" (16 mm) on either side of the weld.

44

Section I, PW-39.2 Welds with Buttering

PW-39.2 When pressure parts of two different P-Number groups are joined by welding, the following applies: (21)

(a) Postweld heat treatment for combinations of P-No. 1, 3, 4, 5A, 5B, 6, 7, 8, and 15E shall be within the temperature range specified in Table PW-39.2. The Notes in Tables PW-39-1 through PW-39-14 shall be applied for the material requiring the higher postweld heat treatment temperature except as noted in PW-39.2.1.

(b) For all other combinations, the postweld heat treatment shall be that specified in Tables PW-39-1 through PW-39-14 and applicable notes for the material requiring the higher postweld heat treatment temperature except as noted in PW-39.2.1.

When nonpressure parts are welded to pressure parts, the postweld heat treatment temperature of the pressure parts shall control.

[illegible] one of the materials in the joint is exempt from postweld heat treatment, then the time and temperature shall be that of the material requiring postweld heat treatment. For the weld to be exempt from postweld heat treatment, each material must satisfy the exemption applicable to its respective P-Number and Group Number in Tables PW-39-1 through PW-39-14.

Pressure part welds and attachment welds using ferritic filler metals that have a specified chromium content of more than 3% shall receive a postweld heat treatment. The postweld heat treatment time and temperature used shall be not less than that shown in Tables PW-39-1 through PW-39-14 and Table PW-39.2 for a base metal of equivalent analysis.

ASME Section I, 2021 Edition

1. Revision allows omission of PWHT from the final weld if part not exempted is buttered [WPS to be qualified with QW-283] and post weld heat treated.

2. Buttering and final fill welding consumable shall either
   a) have a chemistry nominally matching the P-No that is exempted from PWHT per the rules within Table PW-39-1 through Table PW-39-14 or
   b) be an austenitic or Ni base welding consumable

45

Section I, PW-41.2.2 Complete Penetration

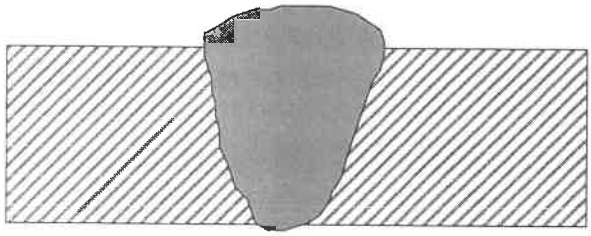
PW-41.2.2 is rewritten to improve its clarity.

- It is now subdivided into 5 subparagraphs [a, b, c, d and e]
- PW-41.2.2(a) now references a new paragraph PW-28.1.4 that clarifies the requirements of single sided butt joints.

46

Section I, PW-41.2.2 Complete Penetration

A new paragraph ***PW-28.1.4*** is introduced to clarify that under Section I rules, joint design is an essential variable for welding procedure qualification when single sided joints are required.



No additional testing is required beyond that specified in Section IX for procedure qualification.

47

Section I, PW-41.2.2 Complete Penetration

Interpretation #:	BPV I-21-03	**Standard Designation:**	BPV Section I
Record Number:	19-2953	**Par/Fig/Table:**	PW-41.2.2
Subject Description:	PW-41.2.2 Complete Weld Penetration in Single-Sided Butt Joints	**Edition/ Addenda:**	2017
Codes & Standards Type:	ASME		

Question: Does PW-41.2.2 permit the use of a production weld in lieu of the qualification of the welding procedure to demonstrate complete penetration at the root of a single welded butt joint?

Reply: No.

48

Section I, PW-51.4, PW-52.2, A-302.11; Retention of Examination Reports

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PW-51.4 is revised to clarify that the code required document that needs to be retained for 5 years is the Radiograph Review Form as required by Section V Article 2, T-292.

Similarly, PW-52.2 is revised to clarify that the code required document that needs to be retained for 5 years is the **Report as required by Section V, Article 4, T-493** which shall include the requirements of T-491 and T-492.

- A-302.11 (Records Retention) is also revised consistently

49

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Section I Code Cases

HSB - Global Inspections and Engineering Services

Presented by: Codes & Standards

50

Code Case 3048
Section I Code Case for Creep Intolerant CSEF Steels in time dependent service for Section I

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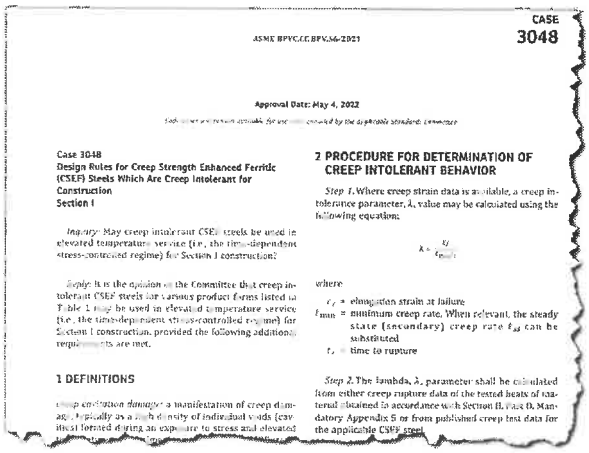
ASME BPVC.CC.BPV.S6 - 2021



ASME BPVC.CC.BPV.S6-2021

CASE
3048

Approval Date: May 4, 2022

Case 3048
Design Rules for Creep Strength Enhanced Ferritic (CSEF) Steels Which Are Creep Intolerant for Construction
Section I

Inquiry: May Creep intolerant CSEF steels be used in elevated temperature service (i.e., the time-dependent stress-controlled regime) for Section I construction?

Reply: It is the opinion of the Committee that creep intolerant CSEF steels for various product forms listed in Table 1 may be used in elevated temperature service (i.e., the time-dependent stress-controlled regime) for Section I construction, provided the following additional requirements are met.

1 DEFINITIONS

creep cavitation damage: a manifestation of creep damage, typically as a high density of individual voids (cavities) formed during an exposure to stress and elevated

2 PROCEDURE FOR DETERMINATION OF CREEP INTOLERANT BEHAVIOR

Step 1. Where creep strain data is available, a creep intolerance parameter, λ, value may be calculated using the following equation:

$$\lambda = \frac{\varepsilon_f}{\dot{\varepsilon}_{min} t_r}$$

where

ε_f = elongation strain at failure
$\dot{\varepsilon}_{min}$ = minimum creep rate. When relevant, the steady state (secondary) creep rate $\dot{\varepsilon}_{ss}$ can be substituted
t_r = time to rupture

Step 2. The lambda, λ, parameter shall be calculated from either creep rupture data of the tested heats of material obtained in accordance with Section II, Part D, Mandatory Appendix 5 or from published creep test data for the applicable CSEF steel

51

Code Case 3048
Section I Code Case for Creep Intolerant CSEF Steels in time dependent service for Section I

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ASME BPVC.CC.BPV.S6-2021

Section I currently, has no rules for CSEF steels that develop the onset of creep cavitation damage which results in very low creep rupture ductility (brittle and unpredictable behavior) in service. This behavior if confirmed renders the CSEF steel damage intolerant.

***Code Case 3048** classifies CSEF steel heats based on an initial review or screening of creep rupture ductility (RofA) and to perform subsequent creep testing to generate a **lambda parameter** to specifically address low creep rupture ductility in design, if confirmed.*

This Code Case also provides alternative design rules, where no rules exist, that are conservative for using intolerant CSEF steels.

52

Code Case 3048
Section I Code Case for Creep Intolerant CSEF Steels in time dependent service for Section I

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ASME BPVC.CC.BPV.S6-2021

Creep strength enhanced ferritic (CSEF) steels are a family of ferritic alloys whose high temperature creep strength is enhanced by the creation of a precise condition of microstructure, specifically martensite or bainite, which is stabilized during tempering by controlled precipitation of temper-resistant carbides, carbonitrides, or other stable and/or meta-stable phases.

53

Code Case 3048
Section I Code Case for Creep Intolerant CSEF Steels in time dependent service for Section I

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creep intolerant CSEF steels: creep cavitation susceptibility is indicated by the limited amount of deformation at the time of creep rupture failure. Such materials will exhibit a reduction of area (RoA) value of <70% for specimens which are creep tested at an applied stress that is <60% of the yield stress at the maximum design metal temperature (Section II, Part D, Subpart 1, Table Y-1).

54

Code Case 3048
Section I Code Case for Creep Intolerant CSEF Steels in time dependent service for Section I

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ASME BPVC.CC.BPV.S6-2021

Lambda Parameter for Creep Intolerant CSEF steels:

Creep intolerant CSEF steels have high susceptibility to creep cavity formation (intolerant behavior), little creep deformation before rupture and high sensitivity to multiaxial stresses (e.g., trending to notch weakening behavior).
The Lambda parameter is calculated using equation below

The lambda parameter shall be calculated from either creep rupture data of the tested heats of material obtained in accordance with ASME Section II Part D Mandatory Appendix 5 or from published creep test data for the applicable CSEF steel.

$$\lambda = \frac{\varepsilon_f}{\dot{\varepsilon}_{min} t_r}$$

ε_f = elongation strain at failure

$\dot{\varepsilon}_{min}$ = minimum creep rate. When relevant, the steady state (secondary) creep rate $\dot{\varepsilon}_{ss}$ can be substituted

t_r = time to rupture

55

Code Case 3048
Section I Code Case for Creep Intolerant CSEF Steels in time dependent service for Section I

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If the value of λ is less than 5, the material shall be classified as creep intolerant material.

If creep rupture testing was not able to be conducted to determine the value of lambda or no published creep rupture data exists for the applicable CSEF steel, *the material shall be classified as* ***creep intolerant*** *and shall follow the requirements of this code case for elevated temperature design.*

56

Code Case 3048
Section I Code Case for Creep Intolerant CSEF Steels in time dependent service for Section I

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Materials identified as creep intolerant with a component design temperature in the time dependent regime shall use a reduced allowable stress. This reduced allowable stress value is dependent on geometry using a K factor. The allowable stress value provided in ASME B&PV Code Section II, Part D, Table 1A, shall be multiplied by a factor, F, defined by the following Equation.

$$F = \frac{1}{1+0.2(K-1)}$$

57

Code Case 3048
Section I Code Case for Creep Intolerant CSEF Steels in time dependent service for Section I

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Table 2
Geometry Factors

Geometry/Feature	K
Cylindrical welded components under internal pressure	1.0
Longitudinal seam welds	1.5
Dished heads	1.5
Unstayed flat heads and covers	2.5
Openings in shells, headers, and heads (with or without compensation)	2.5
Ligaments	2.5
Supports and attachment lugs	2.0

GENERAL NOTE: Use of the above geometry factors does not reduce the risk of failure from creep intolerant behavior. Implementation of the geometry factors simply increases thickness of the component and reduces the allowable stress to increase creep life.

Table 3
Allowable Stress Multiplier

Geometry/Feature	F
Cylindrical welded components under internal pressure	1.000
Longitudinal seam welds	0.909
Dished heads	0.909
Unstayed flat heads and covers	0.769
Openings in shells, headers, and heads (with or without compensation)	0.769
Ligaments	0.769
Supports and attachment lugs	0.833

58

Code Case 3048
Section I Code Case for Creep Intolerant CSEF Steels in time dependent service for Section I

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It has been demonstrated by creep testing that Grade 91 Type 2 CSEF steel does not exhibit creep intolerant behavior. Therefore Grade 91 Type 2 CSEF steel is exempt from this Code Case.

59

Section I, Revise the allowable stress values and Code Case 2180-7 for Grade 122 material

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2180-7 ASME BPVC.CC.BPV-2021

Table 4
Maximum Allowable Stress Values

For Metal Temperature Not Exceeding, °F	Max. Allowable Stress Values, ksi
-20 to 100	25.7
200	25.7
300	25.0
400	24.2
500	23.7
600	23.1
650	22.9
700	22.5
750	22.1
800	21.6
850	21.1
900	20.3
950	19.5
1,000	18.5
1,050	14.4
1,100	10.6
1,150	7.2
1,200	4.5

GENERAL NOTE: The allowable stress values are based on the revised criteria of tensile strength at temperature divided by 3.5, where applicable.

2180-8 ASME BPVC.CC.BPV.S7-2021

Table 2
Maximum Allowable Stress Values

For Metal Temperature Not Exceeding, °F	Maximum Allowable Stress Values, ksi
-20 to 100	25.7
200	25.7
300	25.0
400	24.2
500	23.7
600	23.1
650	22.9
700	22.5
750	22.1
800	21.6
850	21.1
900	20.3
950	19.5
1,000	18.5
1,050	14.4
1,100	10.4 [Note (1)]
1,150	6.8 [Note (1)]
1,200	4.5 [Note (1)]

NOTE:
(1) These values are obtained from time-dependent properties.

60

Section I, Revise allowable stress values, Code Case 2327-2 for Grade 911

2327-2 ASME BPVC.CC.BPV-2021

For Metal Temperature Not Exceeding, °F	Maximum Allowable Stress Values, ksi [Note (1)]
-20 to 100	25.7
200	25.7
300	25.1
400	24.1
500	23.6
600	23.2
650	23.0
700	22.7
750	22.3
800	21.7
850	21.0
900	20.1
950	19.0
1,000	17.7
1,050	14.9
1,100	11.4
1,150	6.7
1,200	...

2327-3 ASME BPVC.CC.BPV.S7-2021

For Metal Temperature Not Exceeding, °F	Maximum Allowable Stress Values, ksi
-20 to 100	25.7
200	25.7
300	25.1
400	24.1
500	23.6
600	23.2
650	23.0
700	22.7
750	22.3
800	21.7
850	21.0
900	20.1
950	19.0
1,000	17.7
1,050	14.4 [Note (3)]
1,100	10.6 [Note (3)]
1,150	7.3 [Note (3)]
1,200	...

61

Section I & Section VIII, Division 1 Code Case for UNS N07208 (VIII Lead Item) Code Case 3024

Ni-Cr-Co-Mo-Ti Precipitation Hardened Alloy UNS N07208

The maximum design temperature is 1600°F (870°C).

Table 1	
ASTM Specifications	
ASTM B366-19	Fittings
ASTM B619-19	Welded Pipe
ASTM B637-18	Bar/Forging/Forging Stock
ASTM B670-07(2018)	Plate/Sheet/Strip
ASTM B983-16e1	Seamless Pipe/Tube
ASTM B1007-17	Welded Tube

62

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Section I Interpretations

HSB - Global Inspections and Engineering Services

Presented by: Codes & Standards

63

BPV I-22-16
WPS Qualification of Improperly Heat-Treated Grade 91

HSB

Standard Designation:	BPV Section I
Edition/Addenda:	2021
Para./Fig./Table No:	Table PW-39-5
Subject Description:	WPS Qualification of Improperly Heat Treated Grade 91 Material
Date Issued:	09/28/2022
Record Number:	22-998
Interpretation Number :	BPV I-22-16
Question(s) and Reply(ies):	Question: When qualifying a WPS as required by Table PW-39-5 Note (3)(d), shall the acceptance criterion of the tension tests be based on the Grade 9 material minimum specified tensile strength value of the applicable product form? Reply: Yes.

64

BPV I-22-16
Table PW-39-5 Note (3)(d)

ASME Section I, 2021 Edition

(3) If a portion of the component is heated above the heat treatment temperature allowed above, one of the following actions shall be performed:
(a) The component in its entirety must be renormalized and tempered.
(b) If the maximum holding temperature in the table or [Note (2)] above is exceeded, but does not exceed 1,470°F (800°C), the weld metal shall be removed and replaced.
(c) The portion of the component heated above 1,470°F (800°C) and at least 3 in. (75 mm) on either side of the overheated zone must be removed and be renormalized and tempered or replaced.
(d) The allowable stress shall be that for Grade 9 material (i.e., SA-213-T9, SA-335-P9, or equivalent product specification) at the design temperature, provided that the portion of the component that was heated to a temperature exceeding the maximum holding temperature is subjected to a final heat treatment within the temperature range and for the time required above. In order to apply the provisions of this paragraph, the Manufacturer must have qualified a WPS with representative test specimens that accurately simulate the thermal history of the production part. Specifically, the qualification specimens first must be heat treated at a similar temperature for a similar time that violated the maximum holding temperature limit and then must receive a final heat treatment for the required time within the temperature range specified by this table. The use of this provision shall be noted in the Manufacturer's Data Report in accordance with PG-5.6.1(c)(1).
(4) For welds made with weld consumables of nominally matching chemistry to the base metal (e.g., AWS B9, B91, B92, ISO CrMo91), after the completion of welding and prior to any postweld heat treatment the weld metal shall be cooled to below 400°F (205°C). Measurement and documentation of temperature are required during this cooling step.

65

BPV I-22-10
Painting of Boiler, prior to hydrotest

Standard Designation:	BPV Section I
Edition/Addenda:	ASME BPVC.I-2021
Para./Fig./Table No:	PG-99 Hydrostatic Test
Subject Description:	Painting of Boiler, prior to hydrotest
Date Issued:	09/09/2022
Record Number:	22-985
Interpretation Number :	BPV I-22-10
Question(s) and Reply(ies):	Question (1): Does Section I prohibit painting boiler pressure parts and boiler external piping including the weld joint, prior to the PG-99 hydrostatic test? Reply (1): No. Question (2): Does Section I prohibit the retention of paint on the completed boiler pressure parts and boiler external piping including the weld joints prior to the Hydrostatic Test to meeting the requirement of PG-99 after the completion of the unit? Reply (2): No.

66

BPV I-22-17
Overlay waterwall Panels

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Standard Designation: BPV Section I
Edition/Addenda: 2021
Para./Fig./Table No: PG-112.6
Subject Description: Overlay waterwall Panels
Date Issued: 09/28/2022
Record Number: 22-1213
Interpretation Number : BPV I-22-17
Question(s) and Reply(ies): Question (1): Is a boiler furnace wall panel that contains no pressure retaining welds with a weld overlay where the overlay is not included in the strength of the tubes required to be stamped and provided with a Manufacturer's Partial Data Report?

Reply (1) : No.

Question (2): Is a single tube containing no pressure retaining welds with a weld overlay where the overlay is not included in the strength of the tubes required to be stamped and provided with a Manufacturer's Partial Data Report?

Reply (2): No.

Question (3): May the parts described in questions 1 and 2 be certified by other means confirming the material and construction are in accordance with the requirements of Section I?

Reply (3): Yes.

67

BPV I-23-02
Recertification of Materials

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Standard Designation: BPV Section I
Edition/Addenda: 2021
Para./Fig./Table No: PG-10.1.1
Subject Description: Recertification of Materials
Date Issued: 01/11/2023
Record Number: 22-1442
Interpretation Number : BPV I-23-02
Question(s) and Reply(ies): Question: May a material certified to an SA material specification be re-certified to a different SA material specification in accordance with PG-10?

Reply: Yes, recertification of material requires ALL rules in PG-10 are met which includes PG-10.1.1.1 where examples are given for compliance (e.g. melting practice, deoxidation, quality, heat treatment, mechanical properties and chemical composition).

68

BPV I-23-03
Section I, PG-73.7.3, Form P-8: Distribution of Completed Form P-8

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Standard Designation:	BPV Section I
Edition/Addenda:	2021
Para./Fig./Table No:	PG-73.7
Subject Description:	Section I, PG-73.7.3, Form P-8: Distribution of Completed Form P-8
Date Issued:	01/11/2023
Record Number:	22-1719
Interpretation Number :	BPV I-23-03
Question(s) and Reply(ies):	Question: When a pressure relief valve manufacturer or assembler has completed application of the Certification Mark and "V" Designator and has completed and signed Form P-8 in accordance with PG-73.7, do the rules of Section I require the completed Form P-8 be supplied with the pressure relief valve? Reply: No. sharing the completed.Form P-8 is a commercial activity outside the requirements of Section I rules.

69

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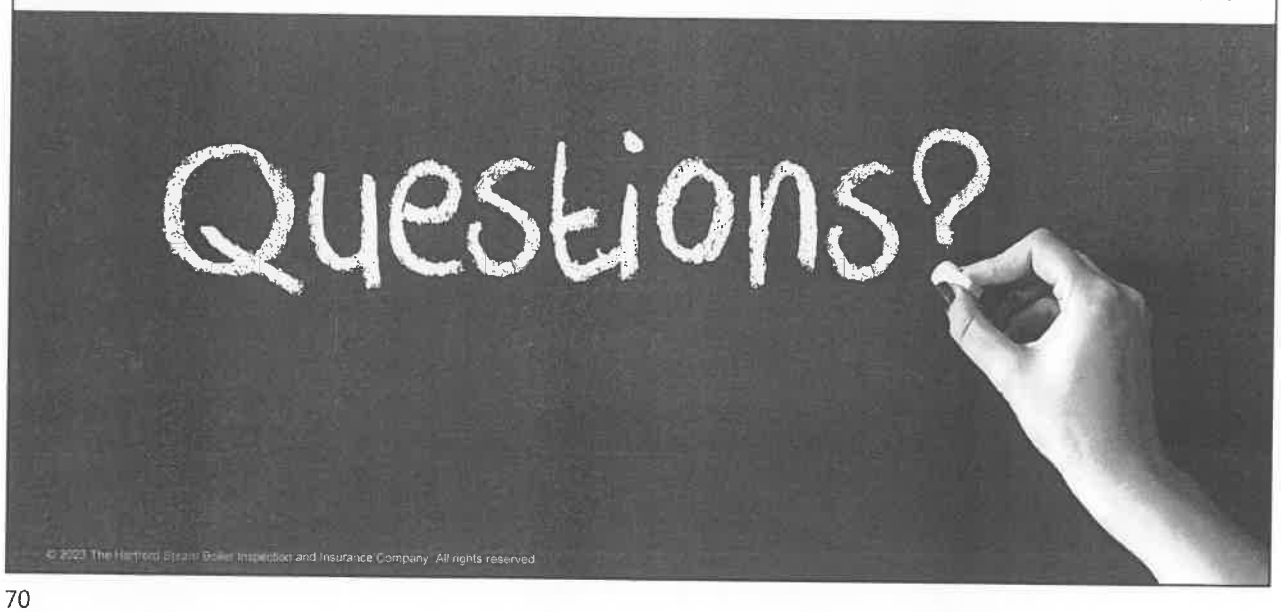

70

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Section II Major Changes

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71

2023 Edition Major Changes to Section II

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Section II, Parts A, B and D had ~170 revisions accomplished since the cutoff date for the 2021 Edition (November 2020) as follows:

- Part A = **~70**
- Part B = **~30**
- Part D (USC & Metric) = **~70**

72

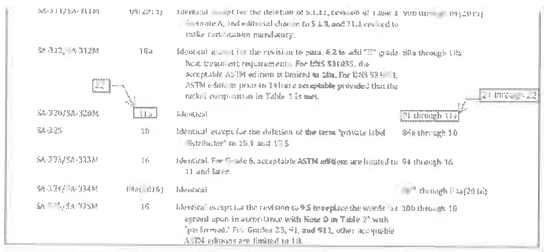
II-A & II-B: Specification Adoptions

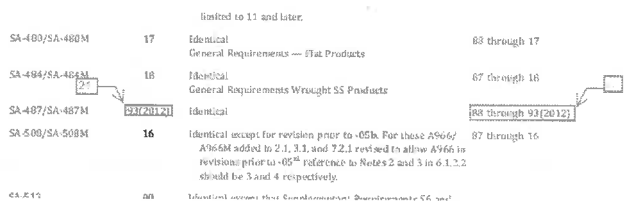
- As of the 2021 Edition, II-A had ***84 specifications*** that would be 10 years old or older as of the 2023 Edition.
  - The oldest is from **1990** .
- There are a large number of specification updates:
  - II-A = [redacted] specifications, *2 deleted specifications*
  - II-B = [redacted] specifications

73

II-A & II-B: Specification Adoptions

ASME Section II Part A , 2021 Edition





SA-480/SA-480M	17	Identical General Requirements — Flat Products	88 through 17
SA-484/SA-484M	16	Identical General Requirements Wrought SS Products	07 through 16
SA-487/SA-487M	93(2012)	Identical	88 through 93(2012)
SA-508/SA-508M	16	Identical except for revision prior to -05b. For these A966/A966M added to 2.1, 3.1, and 72.1 revised to allow A966 in revisions prior to -05[a] reference to Notes 2 and 3 in 6.1.2.2 should be 3 and 4 respectively.	87 through 16

74

II-A & II-B: Specification Revisions

Due to the 2-year publication schedule for Editions (since there are no more Addenda), there is a delay getting revisions out to the industry.

One mechanism for early notification is a **Code Case**, but Code Cases are ***optional***, so they cannot impose stricter requirements to close a "loophole" or to clarify a misinterpretation, and some Jurisdictions have restrictions on adopting Code Cases.

75

Early Code Case Example

This Code Case was published to allow early use of material Grades TP316, TP316H, TP316N and TP316LN already approved by BPV II for SA-312/SA-312M where the range for nickel content allows a wider range with a minimum value of 10.0% compared to previous value of 11.0%.

ASME BPVCCC.BPV.S7-2021

CASE 3015

Approval Date: January 20, 2021
Impending Annulment Date: June 21, 2023

Code Cases will remain available for use until annulled by the applicable Standards Committee.

Case 3015
Use of ASTM A312/A312M-16a Through 18a in Welded Construction in Lieu of SA-312/SA-312M for Grades TP316, TP316H, TP316N, and TP316LN
Section VIII, Division 1

Inquiry: May ASTM A312/A312M-16a through -18a be used in Section VIII, Division 1 welded construction in lieu of SA-312/SA-312M for Grades TP316, TP316H, TP316N, and TP316LN?

Reply: It is the opinion of the Committee that ASTM A312/A312M-16a through -18a may be used in Section VIII, Division 1 welded construction in lieu of SA-312/SA-312M for Grades TP316, TP316H, TP316N, and TP316LN, provided the following requirements are met:

(a) The applicable rules of Section VIII, Division 1 and all other requirements of SA-312/SA-312M shall apply.

(b) The allowable stresses, external pressure chart, physical properties, P-Number, and Group number of Grades TP316, TP316H, TP316N, and TP316LN shall be in accordance with Section VIII, Division 1 and Section II, Part D.

(c) The following requirements are applicable in lieu of ASTM A312/A312M, para. 6.2.

(1) All pipe shall be furnished in the heat-treated condition in accordance with the requirements of SA-312/SA-312M:2019.

(2) For Grade TP316H, the pipes shall be reheated to the specified solution treatment temperature for the required time before quenching.

(3) For the other grades, seamless pipe immediately following hot forming may be individually quenched by water or rapidly cooled by other means, provided that the temperature of the pipes after hot forming is not less than the minimum specified solution treatment temperature in SA-312/SA-312M:2019, Table 2.

(d) This Case number shall be referenced in the documentation and marking of the material and shown on the Manufacturer's Data Report.

76

II-A & II-B: Specification Revisions

- Another mechanism is an ***Intent Interpretation*** that asks "Is it the intent of …?"
  - These Intent Interpretations can then clearly state how to implement the words in the Code.
  - The benefit of the Intent Interpretation is that it gets the word out early before the Edition is published and way before the Edition is mandatory.
- ASME prefers to ***wait for ASTM*** to revise the specification and then adopts the new version, but there are urgent cases where this wait is not possible, and ASME will unilaterally revise the ASME specification while waiting for ASTM.

77

II-A: SA-20 Tension Test Location

- SA-20 11.5.3 requires the ½" round **specimen axis location** at ¼ T
- However, plate of thicknesses ¾" to <1-½" cannot be located at that precise location due to the grip diameter being ¾"
- The ***Intent Interpretation*** and **Revision** to SA-20 permit the specimen axis location at ¼ T

78

II-A: SA-182 "cylindrically-shaped parts"

- During a *nuclear Survey* of an HSB Customer, the Team Leader objected that a part with a machined cone and other "non-cylindrical" features could be **machined from bar** under the provision of SA-182 6.4.
- The ***Intent Interpretation*** and specification **Revision** clarified that the intent was only that "the longitudinal axis of the part is parallel to the longitudinal axis of the bar".
- The Revision also took the opportunity to provide further explanatory text to 6.4 and its subparagraphs.
- The wording was coordinated with [redacted] for the next adopted version.

79

II-A: SA-182 heat treatment

- In SA-182 7.2.1 regarding liquid quenching, Grade "F 3" is listed.
- Looking at the chemistry & mechanical property tables, ***no "F 3" is listed***.
- Apparently, some time in history, Grade F 3 was redesignated as Grade F 12, with Classes 1 and 2.
- The ***Intent Interpretation*** and specification **Revision** replace "F 3" with "F 12, Classes 1 and 2".
- This is a *new permission* for this Grade, not a restriction.

80

II-A & II-B: Mandatory Appendix II

- There was a gross **reformatting** of II-A and II-B Appendix II, including adding a ***Statement of Policy***.
- The 2021 Edition Appendix II contains rules, guidelines and tables of data.
- The [redacted] Edition moves the rules to this new ***Statement of Policy*** placed before the first specification in the book.
- The guidelines and informative material are maintained in Appendix II.
- The tables of data are kept in Appendix II.

81

II-D: Code Cases Incorporations

- Code Cases are intended to be a **temporary** vehicle to permit relaxation of rules in the Code or to introduce new provisions.
  - Note: Code Cases can be revised at which point they "***supersede***" (replace) the previous version.
- Some **Jurisdictions** do not accept Code Cases by default, thus requiring an exception from the Jurisdiction and possibly some commercial pain.

82

II-D: Code Cases Incorporations

- Therefore, the proper path for Code Cases is that they be incorporated after a sufficient time to vet their requirements, and to gain ***experience*** with the new provisions.
- After incorporation, Code Cases can be "automatically" annulled 6 months after incorporation, or manually annulled some time after incorporation.
- Some Code Cases are annulled **without incorporation** due to lack of use or unsuccessful experience.

83

II-D: Code Cases Incorporations

- In the 2023 Edition, approximately **(13) Code Cases were** incorporated as follows:
  - **Section I:** 2192 (cast Gr 91), 2923 (N06617 wld tube)
  - **Section III:** N-655-2 (alignment with II-D)
  - **Section IV:** 2620 (S32101), 2643 (S32003), 2687-1 (S31635 tube), 2778 (S32205), 2849 (S31635 pipe)
  - **Section VIII-1:** 2577 (316L @ ≤1200F), 2586-1 (S32707), 2591 (S31002), 2633 (cast Zr), 2669 (S32202), 2903 (S31655), 2923 (N06617 wld tube)

84

II-D: VIII-2 Class 1 Allowable Stresses

- Many stress lines are added to II-D **Tables 2A and 2B** in both USC and Metric.
- In the E17, the VIII-2 Class 1 available materials was synched up with the list prior to the E07
  - The ***E04 / A06*** Tables 2A and 2B used to be for VIII-2 before the 2 Class system was implemented
- In the [redacted], the VIII-2 Class 1 available materials are synched up with the VIII-2 Class 2 materials (from Tables 5A and 5B)

85

II-D: SA-266 Grade 3 Welding

- SA-266 Grade 3 was [redacted] *by ASTM in 1999* to lower the carbon content to a maximum of 0.35%.
- In II-D, **W Notes prohibited the welding** of this material as it used to have > 0.35% C.
- With the revision to the maximum C content, the prohibition on welding is no longer appropriate.
- The **W Notes were removed** from those stress lines in Tables 1A, 2A and 5A.

86

II-D: Nonferrous Type/Grade Column

- A [redacted] in II-D Tables 2B and 5B, both USC and Metric, is now [redacted]
- Matches up with Tables 1A, 1B, 2A and 5A
- Permits:
  - The [redacted] **listing of a Grade** rather than just the *UNS number*
  - The differentiation of nonferrous material strengths when designated by a ***different Grade with the same UNS***
    - Brought about by the **"H" Grade titanium alloys** with higher strength, but the same chemistry/UNS

87

II-D: Miscellaneous

- [redacted] of **Notes** continues
- Verification and revision of **Section IV** allowables continues; up to **+12%, -8%**
- **Tables U** (tensile strength) **and Y-1** (yield strength) [redacted] and revisions continue
  - These values are not typically used for design, except in special circumstances like heat exchanger design (VIII-1 Part UHX) or design by analysis (DBA)

88

II-D: Miscellaneous

- Any **revisions to specifications** in II-A or II-B for mechanical properties are synched up with the **allowable stress and strength values** in II-D
- Addition of, re-evaluation of, and revisions to **copper** allowable stress and strength values continues, including
- The **Errata to the E21** are in the E23
- E07/A09 II-D, Appendix A, on **hydrogen embrittlement** of cold-worked stainless steels as A-702.1.6

89

II-D: Miscellaneous

- SA-372-F-70 allowables up to **12%** in Tables 1A & 2A
- SB-75 C10200 **O50** to Table 1B and also C12200 **O50** to 6B
- applicability temperature for high-stress lines for **SB-75 C12200 O50** for *Section I*, and for **O60** for *VIII-1 & XII*
- **SA-240 S43932** for *VIII-1 and XII* use

90

II-D: Miscellaneous

- [redacted] many **SB-366 nickel fittings** for *Section III, Classes 2 & 3*
- Deleted **SA-283 Grades A & B** – not in SA-283 anymore
- Revised specification reference for UNS N08904 bar and seamless tube from SB-xxx to SA-xxx

91

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Section II, Parts A, B & D Interpretations

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92

Interpretation II-A-21-13
Lesson learned: data is required

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Para./Fig./Table No: SA-370

Subject Description: Breakage of Charpy Impact Test Specimens

Date Issued: 09/21/2021

Question 1: In accordance with SA-370 Section 25, may an unbroken specimen that cannot be separated by force from bare hands be considered when an average of test results is required for specification conformance?

Reply 1: No

Question 2: Must that specimen be reported as unbroken and an additional specimen tested?

Reply 2: Yes

93

Interpretation II-A-21-20
Lesson learned: data is required

HSB

Para./Fig./Table No: SA-20 Supplementary Requirement S3

Subject Description: Use of Plates with S3 requirement of SA-20

Date Issued: 11/05/2021

Question: May plates that were certified with tests performed in the simulated post-weld heat-treated condition according to SA-20 S3 be used in the as-delivered condition?

Reply: No.

This Interpretation is assuming that **only** the simulated PWHT tension test results are reported on the MTR, which is the minimum that is required. See also BPV II-A-21-17.

94

Interpretation II-A-21-24
Lesson learned: ASTM => ASME

Para./Fig./Table No: SA-249/SA-249M and SA-1016/SA-1016M

Subject Description: Referenced ASTM Specifications

Date Issued: 11/12/2021

Question: When reference is made in an ASME material specification, such as ASME SA-249/SA-249M, to an ASTM specification, such as ASTM A1016/A1016M for which an ASME specification exists, shall the reference be interpreted as applying to or invoking the ASME material specification?

Reply: Yes, see ASME Section II Part A Mandatory Appendix II.

95

Interpretation II-A-21-25
Lesson learned: Mandatory Appendices can be helpful

Para./Fig./Table No: SA-105/SA-105M and SA-350/SA-350M

Subject Description: Acceptability of Multiple Marking

Date Issued: 11/12/2021

Question: May material be dual marked and certified in conformance with both SA-105/SA-105M and SA-350/SA-350M Grade LF2?

Reply: Yes, provided the material conforms with all requirements of both specifications. See Section II Part A Mandatory Appendix III - Guidelines on Multiple Marking of Materials

96

Interpretation II-A-22-01
Lesson learned: things change … for the better

Para./Fig./Table No: SA-182 para. 6.4

Subject Description: Cylindrically-shaped parts

Date Issued: 04/01/2022

Question: Is it the intent that cylindrically-shaped parts need not be pure cylinders but only that the longitudinal axis of the part shall be parallel to the longitudinal axis of the bar?

Reply: Yes.

This **intent** Interpretation was accomplished in SA-182 in the L23.

97

Interpretation II-A-22-09
Lesson learned: hardness scales are important

Para./Fig./Table No: SA-249/SA-249M, Table 3, 13.5

Subject Description: Acceptable Hardness Testing Methods

Date Issued: 05/18/2022

Question: Does SA-249/SA-249M permit compliance with specified Rockwell Hardness requirements in Table 3 to be determined through the conversion of Vickers hardness test results?

Reply: No

Rockwell B and C [and Brinell] hardness values measure a bulk hardness; Vickers only measures a surface hardness. Interpretation II-A-22-12 is similar in intent.

98

Interpretation II-A-22-10
Lesson learned: unit systems are separate

Para./Fig./Table No: SA-266 Table 2

Subject Description: Original gage length

Date Issued: 05/18/2022

Question: When calculating the percent elongation of a tension test specimen from a SA-266/SA-266M forging, must the gauge length be 2 in. for SA-266 and 62.5 mm for SA-266M forgings?

Reply: Yes

Per SA-266, 1.3, the unit systems are independent. Also, per SA-266, 8.1, the metric Test Methods A1058 shall be used for material certified to SA-266M.

99

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Additive Manufacturing

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Additive Manufacturing: Technologies

1. The technologies being most seriously considered are:
   - Laser powder bed fusion (**LPBF**)
   - Direct energy deposition (**DED**):
     - Wire ***GMAW*** of carbon, low-alloy, CSEF, and stainless steels; and Ti and Zr
     - Wire ***EBW*** of Ti alloys
     - Essentially an extension of weld build-up
     - Extensive test data is being collected
2. This is in addition to **powder metal HIP** fabrication already approved in various Code Cases, and in *II-D Appendix 5* and (3) specifications in *II-A & II-B*

101

Additive Manufacturing: Progress

1. ASME initiated a top-level Committee to evaluate additive manufacturing
   - This Committee created **PTB-13**, "Criteria for Pressure Retaining Metallic Components Using Additive Manufacturing", for laser powder bed fusion
   - This Committee is nearing completion of a **model Code Case** for wire DED
2. **Section IX** published **Code Case 3020** for special considerations for *welding qualification* for additive manufacturing using ***GMAW***
   - Incorporated into the E23 as new Article VI (**QW-600**)
3. Sections I, III and VIII are working on **Code Cases**
4. **Other Codes and Standards** (*e.g.*, B31.3, B16, BPE, NBIC) are also considering AM
5. Some significant amount of all-weld-metal **test data** has been provided and is *being analyzed* for "equivalence" to base metal behavior.

102

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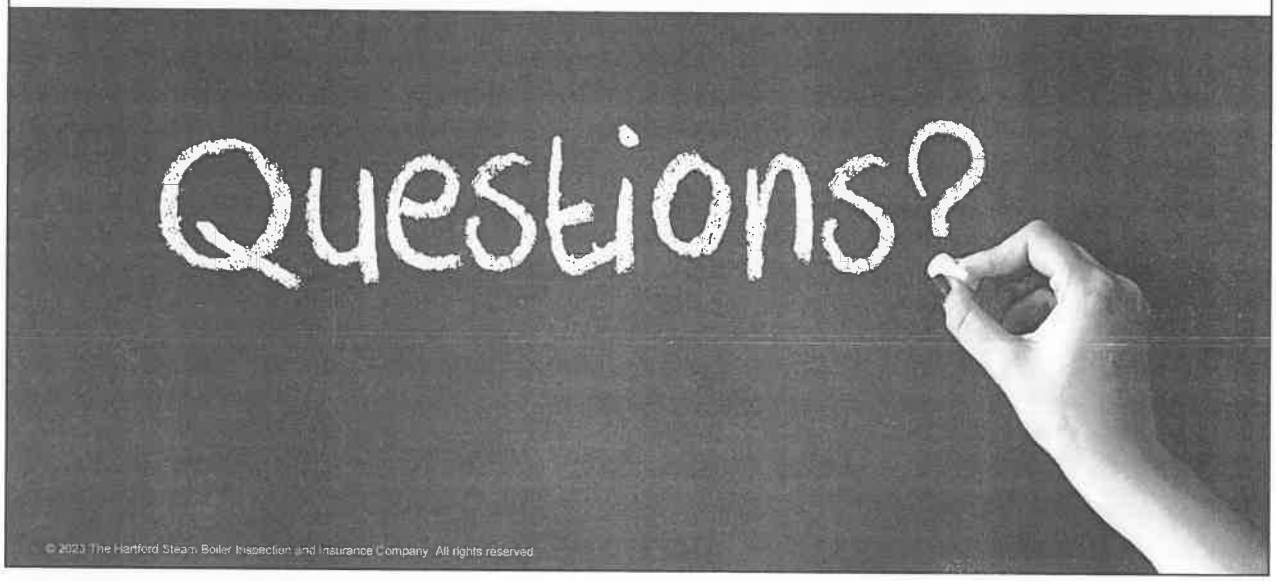

103

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Section V
Major Revisions

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Revisions to T-110(a) and T-120(e) [Article 1]
Listing of NDE Methods and Techniques

(1) T-110(a) (Scope) contained an incomplete listing of the NDE methods included in Section V. **The listing was deleted.**

(2) Text was also added to T-120(e) to indicate:
"This written practice **shall address the methods and techniques that are applicable to the organization's operations** and ,..."

105

Revisions to T-120(e)(1) and T-120(e)(2)
Deletion of Mandatory Appendices III & IV from Article 1.

(1) Revised Para. **T-120(e)(1)** to change reference from "SNT-TC-1A (2016)" to **"SNT-TC-1A (2020)"** and delineated modifications and exceptions to the newly referenced SNT-TC-1A Edition; and

(2) Revised Para. T-120(e)(2) by retaining ANSI/ASNT CP-189 **(2020)** but including an exception to the provisions of its Paragraph 1.5.

These revisions resulted **in the deletion of, Mandatory Appendices III and IV**, respectively from Article 1.

106

T-120(e)(1)

To enable Section V to "accept" the 2020 Edition of SNT-TC-1A and to clarify and simplify modifications to it, Article 1, the modifications are now shown in T-120(e). **This eliminates the need for Mandatory Appendix III. The exceptions or modifications listed below are found in T-120(e)(1) sub-subparagraphs (-a) through (-e) and become mandatory when T-120(e)(1) is invoked by a Construction Code / Standard:**

(-a) SNT-TC-1A is not to be considered as a "recommended practice" – all instances of "should" are to be read as "shall" when establishing requirements of the written practice.

107

T-120(e)(1)

(-b) Paragraph 1.5 of SNT-TC-1A , 2020 is not applicable to specific and practical examinations (see T-120(f) for rules relating to central certification programs).

(-c) Machine problems are specific to Vibration Analysis and are not applicable to NDE practical examinations.

(-d) Technical Performance Evaluation described in Paragraph 10.2 shall be mandatory **prior to recertification** of Level I and Level II personnel, and,

108

T-120(e)(1)

(-e) In addition to the examination requirements of Paragraph 8.7, NDT Level III personnel shall be required to prepare a written procedure, for each applicable method, meeting the requirements of an ASME construction or related inservice inspection Code or Standard prior to initial certification by each employer. For individuals currently certified, the procedure requirement shall be fulfilled at the next recertification event. A minimum passing grade of 80% is required.

(-e)(1) If the NDT Level III candidate will be required to administer practical examinations for certification; or perform examinations, interpretations, or evaluations to an ASME Code or Standard; the candidate shall complete the practical examinations required for a Level II in each applicable technique within the method with their current employer,

109

T-120(e)(1)

(-e)(-2) The composite grade for NDT Level III personnel shall be determined by simple averaging of each required examination, including the written procedure and practical, as applicable, and so recorded. A composite grade of at least 80% is required.

(-e)(-3) Successful completion of the requirements of T-120(e)(1)(-e) [the items listed on this and the previous slide] is required only once with their current employer and is not required to be completed again for recertification.

110

T-120(e)(2)

ANSI/ASNT CP-189 (2020 Edition) ASNT Standard for Qualification and Certification of Nondestructive Testing Personnel, except that,

(-a) The provisions of Paragraph 1.5 are not applicable to specific and practical examinations (see T-120(f) for rules relating to central certification programs).

111

Interpretation V-21-25
Article 1, T-120(f); Alternative to SNT-TC-1A

- Interpretation #: BPV V-21-25
- Standard Designation: Section V
- Edition/Addenda: 2021
- Date Issued: 11/10/2021
- Record Number: 21-1753
- Subject: Para. T-120(f), Alternative to SNT-TC-1A
- Par/Fig/Table: T-120(f)

Question (1): Does utilization of BPV Section V, Article 1, para. T-120(f) provisions require qualification and certification to a written practice meeting all of the requirements in BPV Section V, Article 1, T-120(e)?

Reply (1): Yes.

112

Interpretation V-21-25
Article 1, T-120(f); Alternative to SNT-TC-1A

- Interpretation #: BPV V-21-25
- Standard Designation: Section V
- Edition/Addenda: 2021
- Date Issued: 11/10/2021
- Record Number: 21-1753
- Subject: Para. T-120(f), Alternative to SNT-TC-1A
- Par/Fig/Table: T-120(f)

Question (2): When National or International central certification programs, such as ISO 9712–based programs, are used as permitted by BPV Section V, Article 1, para. T-120(f), may credit be granted under the written practice conforming to para. T-120(e) for the General, Basic, and/or Method examinations completed as part of the central certification program at the discretion of the responsible Level III?

Reply (2): Yes.

113

Interpretation V-21-25
Article 1, T-120(f); Alternative to SNT-TC-1A

- Interpretation #: BPV V-21-25
- Standard Designation: Section V
- Edition/Addenda: 2021
- Date Issued: 11/10/2021
- Record Number: 21-1753
- Subject: Para. T-120(f), Alternative to SNT-TC-1A
- Par/Fig/Table: T-120(f)

Question (3): Is it a requirement to supplement the NDE Level III Basic Examination performed in accordance with National or International central certification programs with "15 questions related to understanding SNT- TC-1A document?"

Reply (3): No.

114

Interpretation V-21-25
Article 1, T-120(f); Alternative to SNT-TC-1A

- Interpretation #: BPV V-21-25
- Standard Designation: Section V
- Edition/Addenda: 2021
- Date Issued: 11/10/2021
- Record Number: 21-1753
- Subject: Para. T-120(f), Alternative to SNT-TC-1A
- Par/Fig/Table: T-120(f)

Question (4): Does BPV Section V, Article 1, paras. T-120(e) & T-120(f) require a specific examination in accordance with the employer's written practice?

Reply (4): Yes.

115

ASME Section I

2023 Section I, A-360 will refer to SNT-TC-1A / CP-189 2020 Editions but makes no mention T-120(e)(1) or T-120(e)(2). That means Section V's modifications are still not required for Section I Written Practices.

116

B31.1 Revisions

B31.1, 2022 Edition, which will be recognized by the 2023 Edition of Section I for BEP, has added the 2020 editions of SNT-TC-1A and CP-189 to Appendix F as referenced documents.

B31.1-2022, 136.3.2 will be changed to read:
(a) 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:

(1) ASME BPVC, Section V, Article 1
(2) ASNT CP-189,
(3) ASNT SNT-TC-1A,
(4) ISO 9712,
(5) Other national or international central certification programs or standards

Therefore, T-120(e)(1) and T-120(e)(2) are still an option just as Mandatory Appendices III & IV are now.

117

Section V, Article 1, T-120(j)

Revised T-120(j) to address personnel certifications made to a previous Edition of Section V. At the point of recertification, new rules must be met in accordance with the updated written practice (**not based on continuing satisfactory performance**). This Code change is based on an Intent Interpretation.V-21-18.

119

Interpretation V-21-18
Article 1, T-120(j), Personnel Qualifications

- Interpretation #: BPV V-21-18
- Standard Designation: Section V
- Edition/Addenda: 2019
- Date Issued: 08/09/2021
- Record Number: 21-319
- Subject: Personnel Qualifications
- Par/Fig/Table: T-120(j)

Question: Is it the intent of T-120(j) that personnel qualifications meeting the rules of a prior Edition of ASME Section V, in effect at the time of certification(s), are valid until recertification?

Reply: Yes.

120

Article 1, T-150(a) & T-150(b)

T-150(a) and T-150(b) were revised to state NDE procedure demonstration to the Inspector **must be performed on a sample with a known discontinuity** or **as otherwise allowed by the referencing Code like in T-221.2 where demonstration of the density and image quality indicator (IQI) image requirements of the written procedure on production or technique radiographs shall be considered satisfactory evidence of compliance with that procedure.**

In addition, T-150(a) was also revised to add sub-subparagraphs (1) and (2) to improve readability.

121

Article 1, Mandatory Appendix I
I-121 General Terms – Definition of High Alloy Steel

high alloy steel - all stainless steels and any other alloy steel in which the sum of all elements, other than iron, exceeds 10% of its weight.

122

Article 1, Mandatory Appendix II, Para. II-122.1
Highlighted Changes

Paragraph II-122.1

II-122.1 In addition to the written examinations specified in Table II-122.1, all CR and DR technique qualifications shall include practical examinations consisting of, as a minimum

(a) Level I and II practical examinations shall require at least two test specimens. These specimens shall be representative of the techniques used in the employer's written procedure(s), e.g., single/double wall exposure, single/double wall viewing.

(b) Each specimen shall contain a minimum of two discontinuities.

(c) The employer's written practice shall define the grading criteria for all written and practical examinations.

General Note (d)(3) of Table II-121-1

(3) an increase in practical examination test specimens required in II-122.1(a), from two to ten.

(-a) The additional test specimens shall include varying thickness, diameter, and exposure techniques representative of those used in the employer's written procedure(s).

(-b) The additional test specimens may be raw, unfiltered digital images provided to the individual with the radiographic technique details requiring only interpretation, evaluation, and documentation of the results.

(-c) Each additional test specimen shall contain at least one discontinuity.

124

Article 2, Table T-276
Add a General Note Regarding 2-2T sensitivity

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Table T-276
IQI Selection

Nominal Single-Wall Material Thickness Range, in. (mm)	IQI					
	Source Side			Film Side		
	Hole-Type Designation	Essential Hole	Wire-Type Essential Wire	Hole-Type Designation	Essential Hole	Wire-Type Essential Wire
≤0.25 (≤6.4)	12	2T	5	10	2T	4
>0.25 through 0.375 (>6.4 through 9.5)	15	2T	6	12	2T	5
>0.375 through 0.50 (>9.5 through 12.7)	17	2T	7	15	2T	6
>0.50 through 0.75 (>12.7 through 19.0)	20	2T	8	17	2T	7
>0.75 through 1.00 (>19.0 through 25.4)	25	2T	9	20	2T	8
>1.00 through 1.50 (>25.4 through 38.1)	30	2T	10	25	2T	9
>1.50 through 2.00 (>38.1 through 50.8)	35	2T	11	30	2T	10
>2.00 through 2.50 (>50.8 through 63.5)	40	2T	12	35	2T	11
>2.50 through 4.00 (>63.5 through 101.6)	50	2T	13	40	2T	12
>4.00 through 6.00 (>101.6 through 152.4)	60	2T	14	50	2T	13
>6.00 through 8.00 (>152.4 through 203.2)	80	2T	16	60	2T	14
>8.00 through 10.00 (>203.2 through 254.0)	100	2T	17	80	2T	16
>10.00 through 12.00 (>254.0 through 304.8)	120	2T	18	100	2T	17
>12.00 through 16.00 (>304.8 through 406.4)	160	2T	20	120	2T	18
>16.00 through 20.00 (>406.4 through 508.0)	200	2T	21	160	2T	20

(c) IQI Placement for W
be placed adjacent to or
number(s) and, when us
be in the area of interest

Insert "General Note: It is recognized that the required Hole-Type Designation or Wire-Type Essential Wire in this Table may not achieve an IQI sensitivity level of 2-2T. This is intentional."

the circumfer-
f the outermost
ghed using one
ons may be re-

Record 20-2725 (Public Review Draft)

126

Revised Article 4, Mandatory Appendix III-479.1

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Record 21-2455 (Public Review Draft)

Due to the possible inability of detecting flaws in the lateral wave and back-wall TOFD "dead zones", "using a technique other than TOFD" was added to allow a manual or semi-automated or automated UT technique other than TOFD for initial flaw detection. This revision was initiated as the result of an Intent Interpretation V-22-13.

III-471.9 Supplemental I.D. and O.D. Near Surface Examination. Due to the presence of the lateral wave and back-wall indication signals, flaws occurring in these zones may not be detected. Therefore, the I.D. and O.D. near surfaces within the area of interest shall be examined per Article 4 **using a technique other than TOFD.** This examination may be performed manually or mechanized; if mechanized, the data may be recorded in conjunction with the TOFD examination.

131

Revised Article 4, Mandatory Appendix VII-421.2

VII-421.2 Procedure Qualification. When required by the referencing Code Section, in lieu of the requirements in T- 150(d), the procedure shall be considered qualified when the supervising Level III and the Inspector are satisfied that the indications produced **by the demonstrated procedure** reveal the length, location, orientation, quantity, and characterization of the discontinuities known to be present in the examined test specimen.

132

Section V, Article 6, Table T-672 (Liquid Penetrant) Address Dwell Time in Table T-672 for HAZ Examination

Record 20-2730 (Public Review Draft)

ARTICLE 6

Delete and Replace: "Welds, Heat-Affected Zones, and Castings"

Table T-672
Minimum Dwell Times

Material	Form	Type of Discontinuity	Dwell Times [Note (1)], (minutes) Penetrant
Aluminum, magnesium, steel, brass and bronze, titanium and high-temperature alloys	~~Castings and welds~~	~~Cold shuts, porosity, lack of fusion, cracks (all forms)~~	5
	Wrought materials — extrusions, forgings, plate	Laps, cracks	10
Carbide-tipped tools	Brazed or welded	Lack of fusion, porosity, cracks	5

135

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Section V Interpretations

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Presented by: Codes & Standards

141

Interpretation V-22-02
Article 2, Para. T- 262.1; Step Wedge Calibration Film

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- Interpretation #: BPV V-22-02
- Standard Designation: Section V
- Edition/Addenda: 2021
- Date Issued: 01/13/2022
- Record Number: 21-1742
- Subject: Step Wedge Calibration Film
- Par/Fig/Table: Article 2, T-262.1

Question (1): In accordance with BPV Section V 2021, Article 2, Para. T-262.1 (a) does a step wedge calibration film need to be traceable to a national standard?
Reply (1): Yes.

Question (2): In accordance with BPV Section V - 2021, Article 2, Para. T-262.1 (a) does the national standard have to be a National Institute of Standards & Technology (NIST) standard?

Reply (2): No.

142

Interpretation V-22-05
Article 1, Mandatory Appendix III, III-112.8(g)(6) and III-112.8(g)(7); Reference to ASNT SNT-TC-1A: 2016

- Interpretation #: BPV V-22-05
- Standard Designation: Section V
- Edition/Addenda: 2021
- Date Issued: 01/13/2022
- Record Number: 21-2054
- Subject: Article 1, Mandatory Appendix III, III-112.8(g)(6) and III-112.8(g)(7)
- Par/Fig/Table: Paras. III-112.8(g)(6) and III-112.8(g)(7)

Question: Does BPV Section V, Article I, Mandatory Appendix III contain additional requirements not found in ASNT SNT-TC-1A?

Reply: Yes.

143

Interpretation V-22-09
Article 1, Mandatory Appendix III, Para. III-112.6(d)(8); Practical Examination

- Interpretation #: BPV V-22-09
- Standard Designation: Section V
- Edition/Addenda: 2021
- Date Issued: 06/07/2022
- Record Number: 21-1824
- Subject: Article 1, Mandatory Appendix III, Para. III-112.6(d)(8);
- Par/Fig/Table: III-112.6(d)(8)

Question: Is the intent of the Note in Article 1, Mandatory Appendix III, Paragraph III-112.6 (d)(8) to be an addition to Table 6.3.1B of ASNT SNT-TC-1A 2016 Edition with 2018 Addendum?

Reply: Yes.

144

Interpretation V-22-10
Article 1, Para. III-112.12(d); Examination Requirements

- Interpretation #: BPV V-22-10
- Standard Designation: Section V
- Edition/Addenda: 2021
- Date Issued: 06/07/2022
- Record Number: 21-1825
- Subject: Level III Examination Requirements
- Par/Fig/Table: III-112.12(d)

Question: In accordance with ASME BPVC Section V, Article 1, Mandatory Appendix III, Para.III-112.12(d), may the examination requirements for recertification of Level III personnel be waived?

Reply: No.

145

Interpretation V-22-11
Article 4, T-472 and T-475

- Interpretation #: BPV V-22-11
- Standard Designation: Section V
- Edition/Addenda: 2021
- Date Issued: 06/07/2022
- Record Number: 21-1993
- Subject: Nozzle to shell weld
- Par/Fig/Table: T-472 & T-475

Question: When required by the referencing Code Section, is it mandatory to perform an examination in accordance with para. T-475 when a nozzle to shell weld is examined with an angle beam technique in accordance with para. T-472 and a straight beam technique in accordance with para. T-472.2?

Reply: Yes.

146

Interpretation V-22-12
Article 1, Para. III-112.10; Technical Performance Evaluation

- Interpretation #: BPV V-22-12
- Standard Designation: Section V
- Edition/Addenda: 2021
- Date Issued: 06/07/2022
- Record Number: 21-2206
- Subject: Technical Performance Evaluation
- Par/Fig/Table: III-112.10

Question: In accordance with Article 1, Mandatory Appendix III, par. III-112.10, may the practical examination for recertification satisfy the technical performance evaluation requirement if administered within 5 years of initial certification?

Reply: Yes.

147

Interpretation V-22-13 (Article 4, Mandatory Appendices III, VII & VIII) Use of TOFD without Supplemental Scan of Near-surface

Standard Designation:	BPV Section V
Edition/Addenda:	2021
Para./Fig./Table No:	III-471, VII-431, VIII-431
Subject Description:	BPV Section V - 2021: Article 4, paras. III-471, VII-431, VIII-431: Use of TOFD without supplemental scan of near-surface
Date Issued:	06/07/2022
Record Number:	21-2454
Interpretation Number :	BPV V-22-13
Question(s) and Reply(ies):	Question (1): Is it the intent of Article 4, Mandatory Appendix III, III-471.9 that a supplemental examination for near-surface indications be performed in conjunction with a TOFD examination? Reply (1): Yes. Question (2): In accordance with Article 4, Mandatory Appendix VII or VIII, may TOFD equipment meeting the requirements of Mandatory Appendix VII, VII-431 or Mandatory Appendix VIII, VIII-431, as applicable, be used for the supplemental scanning of near-surface indications? Reply (2): No. Question (3): When using Article 4, Mandatory Appendix VII or VIII, shall automated or semi-automated techniques other than TOFD be used for initial scanning of near-surface indications? Reply (3): Yes.

148

Interpretation V-22-14
Limited Certification

- Interpretation #: BPV V-22-14
- Standard Designation: Section V
- Edition/Addenda: 2019
- Date Issued: 07/20/2022
- Record Number: 21-669
- Subject: Article 1, Mandatory Appendix III, Paras. 1.1, 6.3.1; Limited Certification
- Par/Fig/Table: 1.1 & 6.3.1

Question (1): Does BPV Section V, Article 1 Mandatory Appendix III, para. 1.1, prohibit the reduction of experience for a limited certification?
Reply (1): No.

Question (2): Does BPV Section V, Article 1, para. T-120 (k) allow the use of limited certifications?
Reply (2): Yes.

149

Interpretation V-22-15
Level III Recertification

- Interpretation #: BPV V-22-15
- Standard Designation: Section V
- Edition/Addenda: 2021
- Date Issued: 07/20/2022
- Record Number: 21-2611
- Subject: Para. III-112.12; Level III Recertification
- Par/Fig/Table: Para. III-112.12

Question: Does BPV Section V, Article 1 Mandatory Appendix III, para. III-112.12, permit waiving of the recertification examinations for an NDE Level III, if they hold a valid ASNT/ACCP Level III NDT Certificate in the method?

Reply: No.

150

Interpretation V-22-16
Article 1,T-120(f) & Mandatory Appendix III-112.8; Use of Outside Agency to administer and grade examinations

- Interpretation #: BPV V-22-16
- Standard Designation: Section V
- Edition/Addenda: 2021
- Date Issued: 08/30/2022
- Record Number: 21-2452
- Subject: Use of Outside Agency to administer and grade examinations
- Par/Fig/Table: T-120(f) & III-112.8

Question: In accordance with Article 1, para. T-120(f), may ISO 9712 specific and practical examinations be used to satisfy the required specific and practical examinations in BPV Section V, Article 1?

Reply: No.

151

Interpretation V-22-17
Article 9, T-952, Magnifying Lens

- Interpretation #: BPV V-22-17
- Standard Designation: Section V
- Edition/Addenda: 2021
- Date Issued: 08/30/2022
- Record Number: 21-2498
- Subject: Magnifying Lens
- Par/Fig/Table: T-952

Question: When performing direct visual examination in accordance with Section V, Article 9, Paragraph T-952, may magnifying lenses be used to assist the examiner?

Reply: Yes.

152

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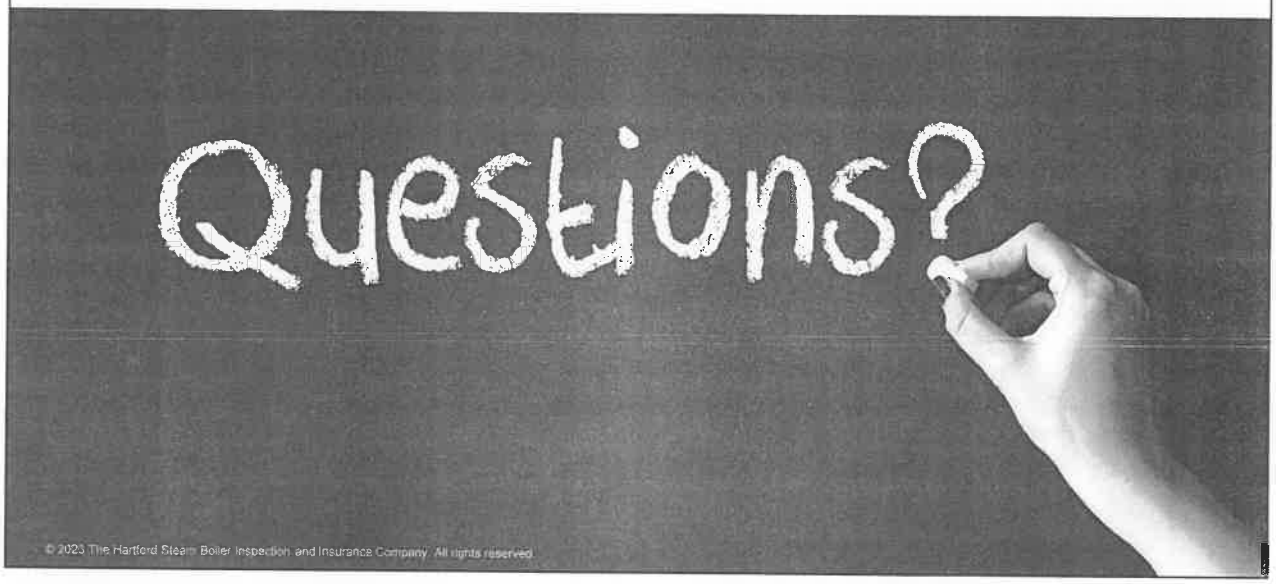

153

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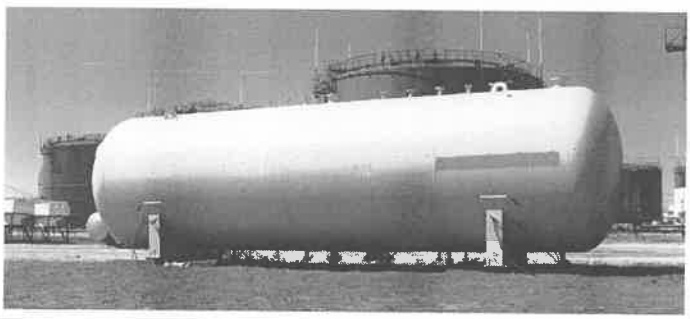
Section VIII Major Revisions



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154

Major Trends in 2023 Section VIII and Beyond

- Section VIII, Division 1 ReShape
  - Common Rules
  - Promote VIII-2 for Construction of Custom Engineered Pressure Vessels
  - Improve Clarity in Standards
  - Give Interpretation Service Lower Priority

155

Project ReShape

- Section VIII, Division 1 continues to be the most widely used pressure vessel standard worldwide.
- Section VIII, Division 1 will celebrate its one-hundred-year anniversary in 2024
- The 791-page standard contains 48 Mandatory Appendices and 26 Non-mandatory Appendices
  - It is not the easiest of standards to navigate for new users.
- In August 2021 ASME conducted a survey of VIII-1 users

156

Project ReShape Survey

- Approximately 630 responses to the survey
- Some of the areas probed in the survey included:
  - Whether there should be a limit on design pressure for VIII-1 vessels
  - Whether there should be a limit on design temperature for VIII-1 vessels
  - Whether the committee should reduce the frequency of issuing new editions
  - Would users support having certain Appendices available as standalone products

Strong majority said YES

Not much support

We can't keep up with the two years cycle. It's a nightmare!

157

Common Rules

- Long term goal is to maintain rules that are common between one or more Section VIII books in one place
  - Better use of volunteer resources
  - Eliminates rules being out-of-sync between the different books
- Two major sets of rules will be removed from VIII-1 in E23, and replaced with references to VIII-2
  - Part UHX – Design rules for shell-and-tube heat exchangers
  - Appendix 26 – Bellows Expansion Joints
- Likely that other rules, such as Appendix 13 Noncircular Vessels, Appendix 9 Jacketed Vessels, Part ULW Layered Vessels will be removed from VIII-1

158

Why the Concern with Clarity in Standards?

RESOURCES > ARTICLES

The Hidden Costs of Complex Language

A workers' compensation claims-administration firm recently required all its claims administrators to attend seminars to help them write clearly. The reason? According to the director of claims, "People don't understand what we're trying to say."

Jargon, regulatory language, abbreviations — the flood of complex language was

Hidden Costs

- Safety
- Time spent interpreting Code Rules
- Project delays
- Rework

Plain Language: The Bottom Line

Why should we use plain language? It saves us time and money. It saves our customers time and money. And it improves compliance with requirements we impose on the public. Here are some examples taken mostly from Professor Joe Kimble's book *Writing for Dollars, Writing to Please*.

159

Defining Plain Language

A communication is in plain language if it meets the needs of its audience—by using language, structure, and design so clearly and effectively that the audience has the best possible chance of readily finding what they need, understanding it, and using it.

Ref: "Defining Plain Language, by Dr. Annetta Cheek; *Clarity* 64 November 2010

160

Example of Improving Clarity in a Code Paragraph Section VIII-1, UG-11 – *Where are the Requirements?*

Section VIII, Div. 1 2021 Edition

1. UG-11 PREFABRICATED OR PREFORMED PRESSURE PARTS FURNISHED WITHOUT A CERTIFICATION MARK

(a) Prefabricated or preformed pressure parts for pressure vessels that are subject to stresses due to pressure and that are furnished by others or by the Manufacturer of the completed vessel shall conform to all applicable requirements of this Division except as permitted in (b), (c), (d), (e), and (f) below. When the prefabricated or preformed parts are furnished with a nameplate that contains product identifying marks and the nameplate interferes with further fabrication or service, and where stamping on the material is prohibited, the Manufacturer of the completed vessel, with the concurrence of the Authorized Inspector, may remove the nameplate. The removal of the nameplate shall be noted in the "Remarks" section of the vessel Manufacturer's Data Report. The nameplate shall be destroyed. The rules of (b), (c), (d), and (e) below shall not be applied to welded shells or heads or to quick-actuating or quick-opening closures (see UG-35.2 and UG-35.3, respectively).

161

Section VIII-1, UG-11 – *Where are the Requirements*

Section VIII, Div. 1 2021 Edition

UG-11 PREFABRICATED OR PREFORMED PRESSURE PARTS FURNISHED WITHOUT A CERTIFICATION MARK

1

(a) Prefabricated or preformed pressure parts for pressure vessels that are subject to stresses due to pressure and that are furnished by others or by the Manufacturer of the completed vessel shall conform to all applicable requirements of this Division except as permitted in (b), (c), (d), (e), and (f) below. When the prefabricated or preformed parts are furnished with a nameplate that contains product identifying marks and the nameplate interferes with further fabrication or service, and where stamping on the material is prohibited, the Manufacturer of the completed vessel, with the concurrence of the Authorized Inspector, may remove the nameplate. The removal of the nameplate shall be noted in the "Remarks" section of the vessel Manufacturer's Data Report. The nameplate shall be destroyed. The rules of (b), (c), (d), and (e) below shall not be applied to welded shells or heads or to quick-actuating or quick-opening closures (see UG-35.2 and UG-35.3, respectively).

162

Section VIII-1, UG-11 – *Where are the Requirements*

Section VIII, Div. 1 2021 Edition

UG-11 PREFABRICATED OR PREFORMED PRESSURE PARTS FURNISHED WITHOUT A CERTIFICATION MARK

2 *(a)* Prefabricated or preformed pressure parts for pressure vessels that are subject to stresses due to pressure and that are furnished by others or by the Manufacturer of the completed vessel shall conform to all applicable requirements of this Division except as permitted in (b), (c), (d), (e), and (f) below. When the prefabricated or preformed parts are furnished with a nameplate that contains product identifying marks and the nameplate interferes with further fabrication or service, and where stamping on the material is prohibited, the Manufacturer of the completed vessel, with the concurrence of the Authorized Inspector, may remove the nameplate. The removal of the nameplate shall be noted in the "Remarks" section of the vessel Manufacturer's Data Report. The nameplate shall be destroyed. The rules of (b), (c), (d), and (e) below shall not be applied to welded shells or heads or to quick-actuating or quick-opening closures (see UG-35.2 and UG-35.3, respectively).

163

Section VIII-1, UG-11 – *Where are the Requirements*

Section VIII, Div. 1 2021 Edition

UG-11 PREFABRICATED OR PREFORMED PRESSURE PARTS FURNISHED WITHOUT A CERTIFICATION MARK

3 *(a)* Prefabricated or preformed pressure parts for pressure vessels that are subject to stresses due to pressure and that are furnished by others or by the Manufacturer of the completed vessel shall conform to all applicable requirements of this Division except as permitted in (b), (c), (d), (e), and (f) below. When the prefabricated or preformed parts are furnished with a nameplate that contains product identifying marks and the nameplate interferes with further fabrication or service, and where stamping on the material is prohibited, the Manufacturer of the completed vessel, with the concurrence of the Authorized Inspector, may remove the nameplate. The removal of the nameplate shall be noted in the "Remarks" section of the vessel Manufacturer's Data Report. The nameplate shall be destroyed. The rules of (b), (c), (d), and (e) below shall not be applied to welded shells or heads or to quick-actuating or quick-opening closures (see UG-35.2 and UG-35.3, respectively).

164

Section VIII-1, UG-11 – *Where are the Requirements*

1. UG-11 PREFABRICATED OR PREFORMED PRESSURE PARTS FURNISHED WITHOUT A CERTIFICATION MARK

Section VIII, Div. 1 2021 Edition

(a) Prefabricated or preformed pressure parts for pressure vessels that are subject to stresses due to pressure and that are furnished by others or by the Manufacturer of the completed vessel shall conform to all applicable requirements of this Division except as permitted in (b), (c), (d), (e), and (f) below. When the prefabricated or preformed parts are furnished with a nameplate that contains product identifying marks and the nameplate interferes with further fabrication or service, and where stamping on the material is prohibited, the Manufacturer of the completed vessel, with the concurrence of the Authorized Inspector, may remove the nameplate. The removal of the nameplate shall be noted in the "Remarks" section of the vessel Manufacturer's Data Report. The nameplate shall be destroyed. The rules of (b), (c), (d), and (e) below shall not be applied to welded shells or heads or to quick-actuating or quick-opening closures (see UG-35.2 and UG-35.3, respectively).

165

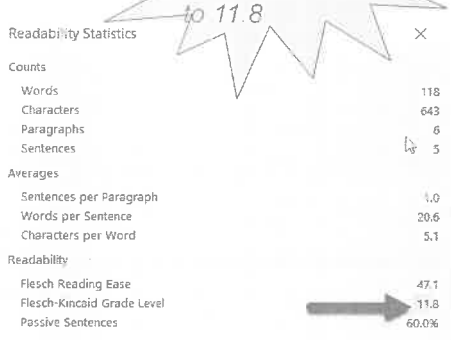
Section VIII-1, UG-11 – Requirements Separated

UG-11

(a) Prefabricated or preformed pressure parts for pressure vessels that are subject to stresses due to pressure and that are furnished by others or by the Manufacturer of the completed vessel shall conform to all applicable requirements of this Division except as permitted in (b), (c), (d), (e), and (f) below.
(b) The nameplate on a prefabricated or preformed part may be removed under the following conditions:
  a. The nameplate interferes with further fabrication or service.
  b. Stamping on the material is prohibited.
  c. Removal of the nameplate requires concurrence of the Authorized Inspector.
(c) The rules of (b), (c), (d), and (e) below shall not be applied to welded shells or heads or to quick-actuating or quick-opening closures (see UG-35.2 and UG-35.3, respectively).

[Note: This is an example only; changes have not yet been approved by the Committee]

Readability score reduced to 11.8



166

Reduction in Section VIII Interpretations

- Pre-pandemic, Section VIII received approximately 150 to 250 inquiries per year.
  - Most submittals not processed (*Consulting Reply, Question already answered in earlier Interp*)
- Committee struggled to keep up with demand
- Starting in 2021, less priority given to Interpretation work;
  - More submittals considered *consulting*
  - or intent interpretations requiring a Code revision
- In 2022 complete shut down of interpretation service
- Section VIII officers need to reset their priorities

YEAR	# INTERPRETATIONS ISSUED
2018	48
2019	23
2020	53
2021	14
2022	1

170

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Section VIII Code Updates

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Presented by: Codes & Standards

171

Removal of Part UHX & App. 26 – Common Rules

- Part UHX and Appendix 26 are the first major sections of VIII-1 that are being deleted as part of Common Rules project
- Only requirements related to design of shell-and-tube heat exchangers removed from Part UHX
- Summary of Changes
  - UHX-1 – Paragraph completely rewritten; provides instructions for locating rules in Part 4.18 of VIII-2
  - UHX-2 - Requirements for materials and methods of fabrication remain in Subsections A, B and C of VIII-1.
  - UHX-3 through UHX-5 Deleted.
  - UHX-8 through UHX-14 Deleted.
  - UHX-16 and UHX-17 Deleted.
  - UHX-18 & UHX-19 unchanged.

172

Removal of Part UHX – Common Rules

Table UHX-1.1
Paragraph Cross Reference List

Topic	Division 2
Scope	4.18.1
Terminology	4.18.2
Design	4.18.3
Tubesheet Design Definitions	4.18.15
Tubesheet Effective Bolt Load, W°	Table 4.18.6
Tubesheet Extension	4.18.5
General Conditions of Applicability for Tubesheets	4.18.4
Tubesheet Characteristics	4.18.6
Rules for the Design of U-Tube Tubesheets	4.18.7
Rules for the Design of Fixed Tubesheets	4.18.8
Rules for the Design of Floating Tubesheets	4.18.9
Bellows Expansion Joints	4.18.11 (See Note 1)
Flexible Shell Elements Expansion Joints	4.18.12 (See Note 2)

Record 21-1768

(Public Review Draft)

173

Removal of Part UHX – Common Rules

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Table UHX-1.2
Reference Paragraph Cross Reference List

Topic	Division 2	Division 1 – 2021 Edition
Jacketed Vessels	4.11	Appendix 9
Bolted Flange Connections	4.16	Appendix 2
Bellows Expansion Joints	4.19	Appendix 26
Flexible Shell Element Expansion Joints	4.20	Appendix 5
Tube-to-Tubesheet Joint Strength	4.21	UW-20
Cone-to-Cylinder Junction under Internal Pressure	4.3.11, 4.3.12	1-5 (See UHX-1(a)(5)(-a)
Cone-to-Cylinder Junction under External Pressure	4.4.13, 4.4.14	1-8 (See UHX-1(a)(5)(-b)
Flanges and Pipe Fittings	4.1.11	UG-44(a)
Tubesheets Without a Bolting Flange	Table 4.2.6	Figure UW-13.2, sketches (a) thru (g)
Tubesheets With a Bolting Flange	Table 4.2.8	Figure UW-13.2, sketches (h) thru (l)
Tubesheets With Butt Weld Hubs	Table 4.2.7	Figure UW-13.3
Allowable Compressive Stress	4.4.12.2 (See Note 1)	UG-23(b)

Note 1. Required by 46-2(a)(1).

Record 21-1768

(Public Review Draft)

NOTE, where Part 4.18 references other locations in VIII-2 for design requirements, such as flexible shell element expansion joints in Part 4.20, the Section VIII, Div. 1 rules in Appendix shall be followed.

174

Removal of Appendix 26 Design Rules for Bellows Expansion Joints– Common Rules

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- Part UHX and Appendix 26 are the first major sections of VIII-1 that are being deleted as part of Common Rules project
- Only requirements related to design of bellows expansion joints are removed from Appendix 26
- Summary of Changes
  - 26-1 – Paragraph completely rewritten; provides instructions for locating rules in Part 4.19 of VIII-2
  - Table 26-1.1 - Addition - This Table provides a cross reference between different Appendix 26 paragraphs and their locations within Part 4.19 of VIII-2.
  - Table 26-1.1 - This table dealing with maximum design temperatures for application of the rules of Mandatory Appendix 26 has been renumbered as Table 26-1.2
  - 26-2 through 26-4 – Deleted
  - 26-6 through 26-9 – Deleted
  - 26-12.1 – Deleted
  - 26-15 - Deleted

175

U-2(j) Instructions to Manufacturer When Ordering Code Stamped Parts

- This new paragraph clarifies the vessel Manufacturer's responsibility when ordering Code stamped parts.
- Main concern is communication and coordination between vessel and part Manufacturers to assure that all applicable Code requirements are satisfied. Below is a list of 9 items that shall be considered:

1.The design requirements established by the user or his designated agent [see U-2(a)];
2.The Certificate Holder that is responsible for design [see UG-120(c)(1)(-b)];.
3.The need for pressure testing by the Manufacturer of the part, including the required test pressure;
4.Impact testing requirements for materials and/or welding procedure qualifications;
5.The compliance with the special requirements for vessels intended for special services [see UG-120(d)];
6.The need for preheat or postweld heat treatment;
7.The extent and method of nondestructive examination (see UW-12),
8.The units of measurement (see U-4);
9.The mandated Edition of the Code to be used for construction (see Mandatory Appendix 43)

176

Section VIII, Divisions 1, 2 & 3 Updates to Reference Standards

- The acceptable year/edition for the following standards have been updated:

Division 1- Table U-3

- ASME B16.1 - 2020 Edition
- ASME B16.5 - 2020 Edition & New Note (4)
- ASME B16.42 - 2021
- ASME B16.47 - 2020 & New Note (4)
- ASME PCC-2 - 2022
- ASTM E186 - 2020
- ASTM E208 - Latest Edition
- ASTM E280 - 2021
- ASTM E446 - 2020
- ISO 148-1 - Latest Edition
- ISO 148-2 - Latest Edition
- ISO 148-3 - Latest Edition
- AWS A4.2M - Latest Edition

Division 2- Table 1.1

- ASME B16.5 - 2020 Edition & New Note (2)
- ASME B16.47 - 2020 & New Note (2)
- ASME PCC-2 - 2022
- ASTM E127 2020
- ASTM E186 - 2020
- ASTM E208 - Latest Edition
- ASTM E280 - 2021
- ASTM E446 - 2020
- ISO 148-1 - Latest Edition
- ISO 148-2 - Latest Edition
- ISO 148-3 - Latest Edition
- AWS A4.2M - Latest Edition

Division 3- Table KG-141

- ASME B16.5 - 2020 Edition & New Note (2)
- ASTM E338 - Deleted
- ASTM E602 - Deleted
- ASTM E1681 - R2021
- ASTM E1820 - 2021
- ASTM E1823 - 2021

Note (4 & 2): The use of a flange or flange fitting that relies on and meets the requirements of a B16 Case is not permitted.

Regarding B16.5 & B16.47 Notes:

Starting with the 2020 Edition of ASME B16.5, the B16 Committee added a new Section 1.10 that automatically adopts B16 Code Cases, that may modify the requirements in ASME B16.5 such as adding new materials or alternative construction requirements. Since Section VIII carefully reviews all reference standards before adopting them, they decided to add a Note just in case B16 publishes a Case for B16.5 or B16.47 that the Section VIII Committee does not want to accept.

177

Section VIII, Division 1
UG-11(e) Subcontracted Brazed Parts

- When UG-11 was completely rewritten in the 2011 Addenda, it included a new option whereby a Certificate Holder could subcontract to a non-certificate holder the fabrication of parts made to a standard other than an ASME product standard.
- This new option is published in UG-11(e) and was inadvertently limited to welded parts.
- In this revision, the terms "welding" and "welded" were replaced with "joining" and "joined" in six locations in UG-11(e) to accommodate all joining methods, including brazing.
- With this change, Interpretation BPV VIII-1-20-40 will no longer be valid for construction to the 2023 and subsequent Editions.

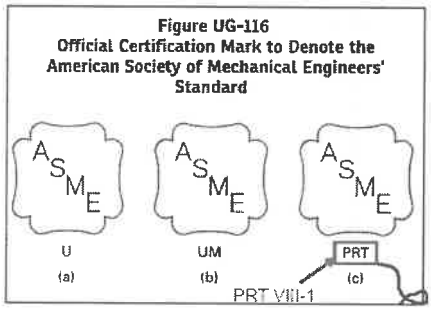
178

Section VIII, Division 1 - PRT Designator

- Conformity assessment requirements are currently published in ASME CA-1.
- In the 2020 edition of CA-1, the PRT designator was revised to now include the applicable code.
- Net result is that throughout VIII-1, the designator "PRT" is replaced with "PRT VIII-1".
- This change occurred in paragraph/Figures UG-116(1)(-b), Figure UG-116, UG-116(h)(1)(-a)(-2), UG-116(h)(1)(-c), UG-117(a), UG-117(f), Figure UG-118).

Record 21-1068 Public Review Draft

Figure UG-116
Official Certification Mark to Denote the American Society of Mechanical Engineers' Standard



87

180

Section VIII, Division 1
UG-35.2 Quick Actuating Closure Rules

- UG-35.2 extensively revised in 2015 Edition with the goal to simplify the rules for quick actuating closures (QAC)
- Shortly after publication of the revised rules an error was identified in ¶ UG-35.2(b)(2):

> (2) Quick-actuating closures shall be designed such that the failure of a single holding element while the vessel is pressurized (or contains a static head of liquid acting at the closure) will not:"

- The phrase: "failure of a single holding element " impacted some Manufacturers such that their QACs no longer complied with UG-25.2.
- The Committee approved a correction by replacing this phrase with: "failure of a single locking element"
- Early implementation Code Case 2912 addressing this correction was issued in March 2018

181

UG-84 Rewrite of Impact Testing Requirements

- There have been over 25 interpretations issued on paragraphs UG-84(g), (h) & (i)
- Revisions to all three paragraphs made to simplify the rules, and in some cases reduce the amount of impact testing of HAZ
- UG-84(g)(1) – Completely rewritten to improve clarity, but no technical changes
- UG-84(g)(2) – Weld impact testing paragraph completely rewritten
  - One technical change related to weld metal specimens; one face of the specimen shall be within 1/16 in. (1.5 mm) of the surface of the material except that the specimens may be located at any depth when the weld has been postweld heat treated

183

UG-84 Rewrite of Impact Testing Requirements

- UG-84(g)(3) – addresses HAZ specimens
  - In 2021 Edition, Figure UG-84.6 and Table UG-84.6 used to define location and # of impact test specimens
  - Table UG-84.6 deleted
  - New rules only require a single set of HAZ impact specimens regardless of base metal thickness
    - Base metal thickness < 1 in. – take specimen at depth that maximizes amount of HAZ at notch centerline
    - Base metal thickness ≥ 1 in. – centerline of specimen shall be located between ½ and ¼ of *t* below the surface.

Section VIII, Division 1 2021 Edition

Figure UG-84.5
HAZ Impact Specimen Removal

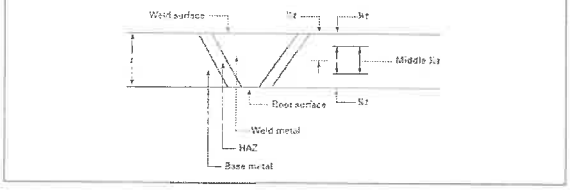
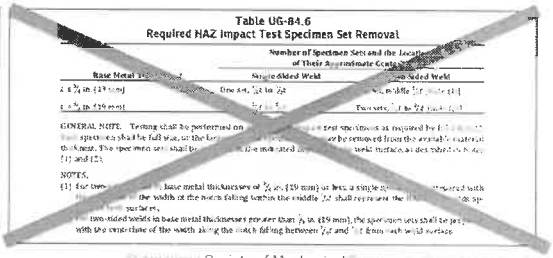


Table UG-84.6
Required HAZ Impact Test Specimen Set Removal

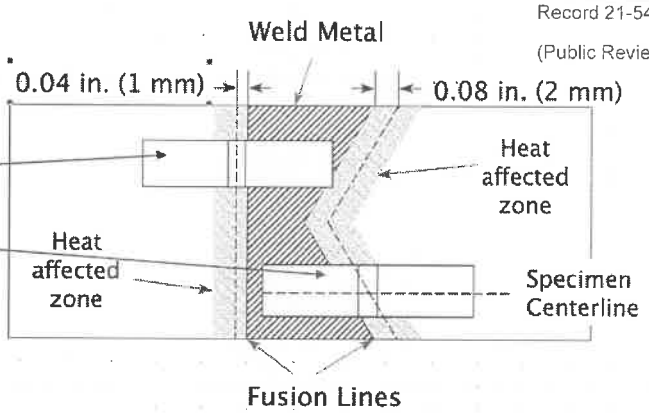


184

UG-84 Rewrite of Impact Testing Requirements
UG-84(g)(3) Cont.

- UG-84(g)(3) -- addresses HAZ specimens
  - New Fig. UG-84.6 provides guidance on locating notch centerline for the case where the HAZ is approximately normal to material surface, or when the HAZ is at an angle to the material surface.

Record 21-544
(Public Review Draft)



185

UG-84 Rewrite of Impact Testing Requirements
UG-84(h)

- UG-84(h) – addresses Impact Test of Welding Procedure Qualifications
- Entire paragraph rewritten to:
  - Improve clarity
  - Simplify rules for impact testing multi-process test coupons
- UG-84(h)(2)(-b) – Guidance given concerning the orientation and location of the HAZ specimen:

> To sample as much of the heat-affected zone as possible, use of a joint design where only one side of the joint is beveled (i.e. a single-bevel or double-bevel groove weld) is recommended. See Figure UG-84.6).

186

UG-84 Rewrite of Impact Testing Requirements
UG-84(h)

- UG-84(h)(2)(-c) – addresses test plate material for Part UCS material
  - The requirement that the test plate material be of the same P-Number and Group Number has been deleted. [Not needed since this already addressed in Section IX Supplementary Essential Variables for weld procedures qualified with impact tests]
  - The requirement concerning the test plate material heat-treated condition has been revised as follows:

> For vessels constructed to the rules of Part UCS, the test coupon material shall be in the same heat-treatment condition (as-rolled, normalized, quenched and tempered, etc.) before welding as the vessel to be constructed. The heat-treatment condition shall be recorded on the PQR and specified on the WPS. This requirement does not apply to P-No. 1, Gr. Nos. 1 and 2 materials with the exception of SA-737 and SA-841.

  - The requirement that the material used for the test coupon meet the minimum toughness requirements of (c)(4) for the thickest material of the range of the base material qualified by the procedure has been revised such that this rule applies to all materials, not just Part UCS materials.

187

UG-84 Rewrite of Impact Testing Requirements UG-84(h)

- UG-84(h)(3) – contains general requirements for the welding processes qualified with impact tests
  - Introduces requirements for multi-process impact testing when more than one set of essential or supplementary essential variables for process is recorded on a procedure qualification record.
  - For the case when a test coupon contains two weld processes:
    - Weld metal test specimens shall contain as much of the weld metal from each process as practical
    - Specimens shall be located within 1/16 in. (1.5 mm) of a surface.
  - For the case when a test coupon contains more than two welding processes:
    - Not possible to take specimens near the surface.
    - Weld metal impact specimens shall be taken at the thickness where the process is located.
  - HAZ specimens shall be prepared from material that was removed at the thickness plane associated with the weld metal from each process.
- UG-84(i) – Title changed to: Vessel Production Welding Impact Testing
  - Several editorial changes
  - UG-84(i)(3)(-b)(-5) deleted – rule associated with HAZ impact specimen removal location
- COMMON RULE – IDENTICAL REVISIONS MADE TO 3.11.8.2, 3.11.8.3 AND 3.11.8.4 IN VIII-2

188

Section VIII, Division 1 – Impact Test Requirements for Diffusion Welding – UG-84(d)(3)

- Diffusion welding (DFW) is a joining process by heat and pressure where the contact surfaces are joined by diffusion of atoms with no macroscopic deformation or relative motion. It contains no weld metal and does not produce a heat affected zone.
- Rules for impact test requirements for diffusion welding have been added to new paragraph UG-84(d)(3).

Record 21-2636 Public Review Draft

UG-84(d)

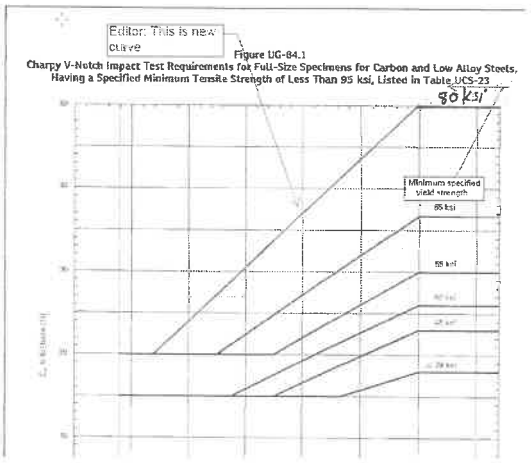
(3) Impact Tests of Diffusion Welded Assemblies
When impact test is required to verify the MDMT, impact test shall be performed as below.
(a) The diffusion welded assembly test block shall be prepared in accordance with QW-185.1 of Section IX.
(b) Two sets of impact test specimens shall be removed and tested.
(1) One set of test specimens shall be taken perpendicular to the interface planes of the test block.
(2) One set of test specimens shall be removed parallel to the interface planes of the test block.
(c) The impact test temperature and acceptance criteria for the impact test results shall be in accordance with the specified requirements given in Subsection C for the base metal.

189

Section VIII, Division 1
Figure UG-84.1/M CVN Energy Acceptance Criteria

- Figure UG-84.1/M contains Charpy V-Notch impact test acceptance criteria for carbon low alloy steels having a specified minimum tensile strength of less than 95 ksi.
- There are five curves in the Figure covering a range of minimum specified yield strength from <38 ksi to 65 ksi.
- A 6th curve is added for 80 ksi

Record 21-1811 Public Review Draft



191

Section VIII, Division 1
Plate Heat Treatment Marking

- The purpose of this revision to UG-85 is to maintain consistency with the latest edition of SA-20, para. 13.1.2 dealing with plate specification heat treatments.
- Letter "T" replaced with "MT"

Record 21-2614 Public Review Draft

Vessel (production) impact test
all joints for which impact tests
elding procedure by UCS-67
pt where production test plates
by these paragraphs). Test shall
tal and/or heat-affected zone to
he procedure test (see UCS-67

Impact Test Plates Required
el, one test plate shall be made
ure used for Category A and B
is one of several as defined in

"G" (denoting green)

shall be unacceptable. Reheat treatment and retesting or retesting only are permitted.

letters "MT" (denoting material treatment)

UG-85 HEAT TREATMENT

When plate specification heat treatments are not performed by the material manufacturer, they shall be performed by, or be under the control of, the Manufacturer who shall then place the letter "T" following the letter "G" in the Mill plate marking (see SA-20) to indicate that the heat treatments required by the material specification have been performed. The Manufacturer shall also document in accordance with UG-93(b) that the specified heat treatment has been performed.

UCS-85, UHT-5(c), and UHT-81 provide requirements for heat treatment of test specimens.

Section II, Part A SA-20 2021 Edition

13.1.2 Plates that are required to be heat treated, but have not been so heat treated, shall be marked, by the manufacturer or processor, with the letter "G" (denoting green) following the required ASTM designation mark, except that "G" marking is not necessary if such plates are for shipment, for the purpose of obtaining the required heat treatment, to an organization under the manufacturer's control. Plates that are required to be heat treated, and have been so heat treated, shall be marked, by the party that performed the heat treatment, with the letters "MT" (denoting material treated) following the required ASTM designation mark.

NOTE 2—Any stress relief of test specimens intended to simulate

COMMON RULE – Section VIII, Division 2, Part 3, 3.2.7.1(c)

192

Section VIII, Division 1 – Recommended Pressure Test Temperature – UG-99(h) and UG-100(c)

- For hydrostatic tests, the test temperature is addressed in UG-99(h) and is a recommended value
  - 30°F (17°C) above the MDMT, with additional consideration given to UG-20 and Fig. UCS-66.2, Note (6).
- The reference to Fig. UCS-66.2 Note (6) deals with the situation where the test pressure is based on "new and cold" condition [UG-99(c) calculated test pressure] and the recommended test temperature based on the MDMT determined per Fig. UCS-66.2.
  - Users were having difficulty understanding the rule given in Note 6 of Fig. UCS-66.2.
- UG-99(h) completely rewritten;
  - The coldest test temperature for all materials not covered in Part UCS should be 30° (17°C) warmer than the vessel MDMT and shall never be colder than the vessel MDMT.
  - For Part UCS materials, several cases now presented to establish the recommended test temperature based on how the MDMT is determined; e.g. UG-20(f), UCS-66(a), UCS-66(a) & UCS-66(b) or (i)
    - Additional calculations required when the low stress exemption rules of UCS-66(b) are applied.
  - Similar revisions made to UG-100(c), except that for pneumatic tests, the test temperature is mandatory.

COMMON RULE – VIII-2 ¶ 8.2.4

Section VIII, Division 1 – Recommended Pressure Test Temperature – UG-99(h) and UG-100(c)

Public Review Draft

Record 18-278

Paragraph UG-99(h) completely rewritten

[g] all welded seams that will be hidden by assembly are given a visual examination for workmanship prior to assembly;

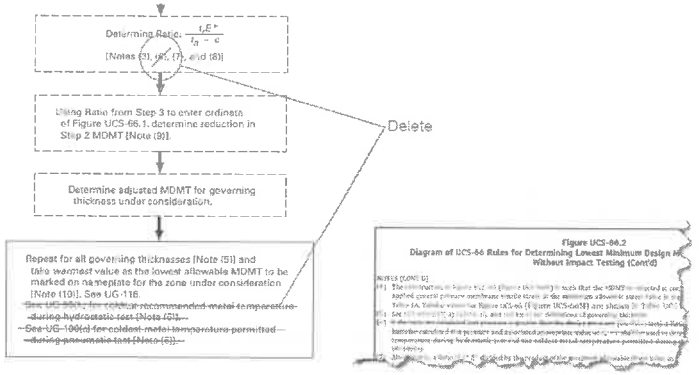
(h) the vessel will not contain a "lethal" substance.

(h) Any nonhazardous liquid at any temperature may be used for the hydrostatic test if below its boiling point. Combustible liquids having a flash point less than 110°F (43°C), such as petroleum distillates, may be used only for near atmospheric temperature tests. It is recommended that the metal temperature during hydrostatic test be maintained at least 30°F (17°C) above the minimum design metal temperature, but need not exceed 120°F (48°C), to minimize the risk of brittle fracture. [See UG-20 and Figure UCS-66.2, Note (6).] The test pressure shall not be applied until the vessel and its contents are at about the same temperature. If the test temperature exceeds 120°F (48°C), it is recommended that inspection of the vessel required by (g) above be delayed until the temperature is reduced to 120°F (48°C) or less.

CAUTION: A small liquid relief valve set to 1⅓ times the test pressure is recommended for the pressure test system, in case a vessel, while under test, is likely to be warmed up materially with personnel absent.

(i) Vents shall be provided at all high points of the vessel in the position in which it is to be tested to purge possible air pockets while the vessel is filling.

Fig. UCS-66.2 revised to remove Note 6



Section VIII, Division 1 – Recommended Pressure Test Temperature – UG-99(h) and UG-100(c)

Public Review Draft

Record 18-278

New UG-99(h):

(h) Minimum Hydrostatic Test Temperature. ... nonhazardous at any temperature.

(1) Any nonhazardous liquid at any temperature may be used for the hydrostatic test if below its boiling point. Combustible liquids having a flash point less than 110°F (43°C), such as petroleum distillates, may be used only for near atmospheric temperature tests.

(2) For materials not covered in Part UCS, to minimize the risk of brittle fracture, the coldest metal temperature during the hydrostatic test should be at least 30°F (17°C) warmer than the vessel MDMT and shall never be colder than the vessel MDMT.

(3) For Part UCS materials, to minimize the risk of brittle fracture, the coldest metal temperature during the hydrostatic test should be at least 30°F (17°C) warmer than one of the following, as applicable:

(-a) The MDMT marked on the nameplate when the requirements of UG-20(f) have been met.

(-b) The MDMT marked on the nameplate when the UCS-66(b) or UCS-66(c) coincident ratio has not been applied to calculate the vessel MDMT. The allowable reduction in MDMT permitted by UCS-68(c) may be used when applicable.

(-c) The temperature determined from either Figure UCS-66/UCS-66M or from impact testing when the UCS-66(b) or UCS-66(c) coincident ratio has been applied to calculate the vessel MDMT. The allowable reduction in MDMT permitted by UCS-68(c) may be used when applicable.

(4) Further reduction in the coldest metal temperature during the hydrostatic test determined from (3)(-b) or (3)(-c) may be achieved by following the rules in Figure UCS-66.2, with Step 3 modified as shown below:

(-a) Calculate f, for a pressure equal to the test pressure divided by 1.3 plus pressure due to hydrostatic head, using the allowable stress given in Section II, Part D, Subpart 1 for the material at the pressure test temperature.

(-b) The value of c shall be zero

(-c) The value of t shall be one of the following, as applicable:

(-1) the nominal noncorroded thickness when Part UCL has not been applied

(-2) the nominal thickness of the base material when Part UCL-23(a) or Part UCL-23(b) has been applied

(-3) the thickness defined in UCL-23(c) when Part UCL-23(c) has been applied.

(5) The test pressure shall not be applied until the vessel and its contents are at about the same temperature.

(6) The metal temperature during the hydrostatic test need not exceed 120°F (48°C). If the test temperature exceeds 120°F (40°C), it is recommended that inspection of the vessel required by (g) above be delayed until the temperature is reduced to 120°F (48°C) or less.

CAUTION: A small liquid relief valve set to ... the test pressure is recommended for the pressure test system. In case a vessel, while under test, is likely to be warmed up substantially with personnel ... there.

195

Section VIII, Division 1 UG-101(a)(5) Sharing Proof Test Reports

- Code philosophy always mandated that each Manufacturer (Certificate Holder) shall be responsible for the design of the pressure vessel, including the case where the MAWP is established by a proof test.
- Numerous inquiries from companies asking if it was permissible for two Manufacturers who are owned by the same entity to share proof test results.
- After years of debate, the Committee reached consensus on the following rules: see next slide

196

UG-101(a)(5) Sharing Proof Test Reports

1. QCS shall describe operational control and authority for technical implementation of shared proof test reports, fabrication drawings and procedures for assembly of the vessel.
2. Fabrication drawings and welding, brazing and bolting procedures shall be identical to those used to produce the proof test report
3. Each Manufacturer takes full responsibility for each shared proof test report and documents this by making reference to the specific proof test performed by the original qualifying Manufacturer and the location where the proof test was performed.
4. Each Manufacturer submits the shared proof test to the Inspector for acceptance,
5. Weld procedures shall be identical, with respect to variables used, to the procedures originally used to weld or braze the proof tested object.
6. The shared proof test remains valid even when the original qualifying Manufacturer no longer holds a valid ASME U Certificate of Authorization or has a name change.

197

Section VIII, Division 1
UG-101(m) Revision to Burst Test Procedure

- When performing a burst test per UG-101(m) to establish the MAWP, the actual tensile strength of the material being tested must be known.
- For all material other than cast materials, two equations are given in UG-101(m)(2)(-a) to calculate P

$$P = \frac{B}{4} \cdot \frac{S_\mu E}{S_{\mu\, avg}} \text{ or } P = \frac{B}{4} \cdot \frac{S_\mu E}{S_{\mu r}}$$

- In the first equation, the specified minimum tensile strength at room temperature, S_μ, is divided by the average actual tensile strength of test specimens at room temperature, $S_{\mu\, avg}$.
- To determine $S_{\mu\, avg}$ requires samples to be taken from the material used to fabricate the vessel or component being tested.

Next Slide

198

Section VIII, Division 1
UG-101(m) Revision to Burst Test Procedure

- The Committee received an inquiry asking if the tensile strength reported on an MTR could be used for $S_{\mu\ avg}$.
- Initial response was NO; however, upon reconsideration the Committee approved the following revised definition:

> $S_{\mu\ avg}$ = average actual tensile strength of test specimens at room temperature, or the tensile strength reported on the material test report when postweld heat treatment is not applied to the production component.

- Note that an early implementation Code Case was approved for this revision to UG-101(m)(2)(-a). The Case Number is 3065.

199

UW-20 Merger of Mandatory & Nonmandatory Tube-to-Tubesheet Strength Rules

- Rules of Nonmandatory Appendix A "Basis for Establishing Allowable Loads for Tube-to-Tubesheet Joints" merged with UW-20 "Tube-to-Tubesheet Welds" – Appendix A deleted
- Appendix A rules now become mandatory.
- VIII-1 now consistent with VIII-2

Section VIII, Div. 1 2021 Edition

NONMANDATORY APPENDIX A
BASIS FOR ESTABLISHING ALLOWABLE LOADS FOR TUBE-TO-TUBESHEET JOINTS

(21) **A-1 GENERAL**

(a) This Appendix provides a basis for establishing allowable tube-to-tubesheet joint loads, except for the following:

(1) Tube-to-tubesheet joints having full strength welds as defined in accordance with UW-20.2(a) shall be designed in accordance with UW-20.4 and do not require shear load testing.

(2) Tube-to-tubesheet joints designed for required loads using partial strength welds as defined in accordance with UW-20.2(b)(1) shall be designed in accordance with UW-20.5 and do not require shear load testing.

(b) The rules of this Appendix are not intended to apply [illegible]

(e) In the selection of joint type, consideration shall be given to the mean metal temperature of the joint at operating temperatures (see 3-2) and differential thermal expansion of the tube and tubesheet which may affect the joint integrity. The following provisions apply for establishing maximum operating temperature for tube-to-tubesheet joints:

(1) Tube-to-tubesheet joints where the maximum allowable axial load is controlled by the weld shall be limited to the maximum temperature for which there are allowable stresses for the tube or tubesheet material in Section II, Part D, Subpart 1, Table 1A or Table 1B.

Tube-to-tubesheet joints in this category are any of the following:

(-a) those complying with (a)(1) or (a)(2) with or [illegible]

200

Section VIII, Division 1 – UW-28

- In the 2021 Edition Section IX added rules permitting simultaneous qualification of procedures by multiple organizations. One condition is that this provision is only permitted when allowed by referencing Code.
- New paragraph UW-28(d) added to VIII-1 permitting use of simultaneous procedure qualification rules of QG-106.4.

COMMON RULE – VIII-2 6.2.2.2

Section IX 2021 Edition

(21) **QG-106.4 Simultaneous Procedure Qualifications.** When expressly permitted by the referencing code, welding procedures may be simultaneously qualified by more than one organization, provided that each organization accepts full responsibility for any such qualifications and the following requirements are met:

(a) Each participating organization shall be represented by an individual with responsibility for qualification of joining procedures, as detailed in QG-106.

(b) A preliminary joining procedure specification acceptable to the representatives of each participating organization shall be prepared addressing the essential and

201

Section VIII, Division 1 UW-35 and UW-36 Revisions

- More than 15 Interpretations have been issued on UW-35;
- Paragraph revised to improve clarity

Section VIII, Division 1 2021 Edition

UW-35 FINISHED LONGITUDINAL AND CIRCUMFERENTIAL JOINTS (21)

(a) Butt-welded joints shall have complete penetration and full fusion. As-welded surfaces are permitted; however, the surface of welds shall be sufficiently free from coarse ripples, grooves, overlaps, and abrupt ridges and valleys to permit proper interpretation of radiographic and other required nondestructive examinations. If there is a question regarding the surface condition of the weld when interpreting a radiographic image, the image shall be compared to the actual weld surface for determination of acceptability.

(b) A reduction in thickness due to the welding process is acceptable provided all of the following conditions are met:

Record 21-12298 Public Review Draft

UW-35 Completed Welds

(a)Butt-welded joint shall have complete penetration and full fusion.

(b) As-welded surfaces are permitted; however, the surface of welds shall be sufficiently free from coarse ripples, grooves, overlaps, and abrupt ridges and valleys to permit proper interpretation of radiographic and other required nondestructive examinations. If there is a question regarding the surface condition of the weld when interpreting a radiographic image, the image shall be compared to the actual weld surface for determination of acceptability.

(c) A reduction in thickness due to the welding process is acceptable provided all of the following conditions are met:

See next slide

202

Section VIII, Division 1
UW-35 and UW-36 Revisions

- Paragraph revised to improve clarity

Record 21-2298 Public Review Draft

~~(d)~~ (e) To assure that the ~~weld grooves~~ butt welded joints are completely filled so that the surface of the weld metal at any point does not fall below the surface of the adjoining base materials,49 weld metal may be added as reinforcement on each face of the weld. The thickness of the weld reinforcement on each face shall not exceed the following:

UW-36 FILLET WELDS

In making fillet welds, the weld metal shall be deposited in such a way that ~~adequate penetration~~ fusion into the base metal at the root of the weld is secured. The reduction of the thickness of the base metal due to the welding process at the edges of the fillet weld, which includes undercut, shall meet the same requirements as for butt welds [see UW-35(~~b~~ c)].

203

Section VIII, Division 1 – Table UCS-56.1

- Table UCS-56.1 provides an alternative to conduct PWHT at a lower temperature, but over a longer time period
- Table UCS-56.1 currently contains 4 rows covering temperature decreases of : 50°F (28°C), 100°F (56°C), 150°F (83°C) and 200°F (111°C)
- The Table does not address whether or not interpolation is permitted, nor any instruction on whether one could decrease the minimum specify temperature by value less than 50°F
- Revisions made include:
  - Interpolation between values greater than 50°F (28°C) permitted
  - NOTE (1) revised to read: (1) Minimum holding time for 1 in. (25 mm) thickness or less. Add 15 min for each additional inch (25 mm) of thickness greater than 1 in. (25 mm).
  - Decrease in PWHT temperature of 50°F (28°C) or less now addressed.

COMMON RULE [VIII-2 Table 6.16]

204

Section VIII, Division 1 - Restating Minimum PWHT Holding Time for Improved Clarity – Table UCS-56

- These revisions to the carbon and low alloy steel postweld heat treatment tables are intended to improve clarity of the holding time definitions. Two types of revisions were made to accomplish this:

1. Replace use of "min/in." with the phrase "for each additional inch".

EXAMPLE

From Table UCS-56-5 - Minimum Holding Time

Current Code: 1 hr minimum, plus 15 min/in. (25 mm) for thickness over 1 in. (25 mm).

2023 Edition: 1 hr minimum, plus 15 min for each additional inch (25 mm) over 1 in. (25 mm).

Next Slide

Record 21-2308 Public Review Draft

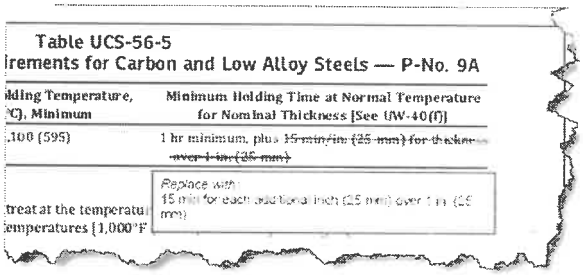


Table UCS-56-5
irements for Carbon and Low Alloy Steels — P-No. 9A

ding Temperature, °C), Minimum	Minimum Holding Time at Normal Temperature for Nominal Thickness [See UW-40(f)]
100 (595)	1 hr minimum, plus ~~15 min/in. (25 mm) for thickness over 1 in. (25 mm)~~
treat at the temperatu temperatures [1,000°F	*Replace with:* 15 min for each additional inch (25 mm) over 1 in. (25 mm)

These revisions made to following Tables:

Tables UCS-56-1,2,3,4,5,6,7,8,9 and

Tables UHA-32-1.2.3.4.5.6.7

205

Section VIII, Division 1 - Restating Minimum PWHT Holding Time for Improved Clarity – Table UCS-56

2. Holding time values in PWHT tables removed where the information was redundant, such as where the values are duplicated for larger thicknesses.

EXAMPLE

In Table UCS-56-1, the holding time over 2 in. to 5 in. is defined as: "2 hr plus 15 min for each additional inch (25 mm) over 2 in. (50 mm). This same holding time definition is repeated for nominal thickness over 5 in. (125 mm) and is therefore removed.

COMMON RULE – Section VIII, Division 2, Tables 6.8 through 6.15

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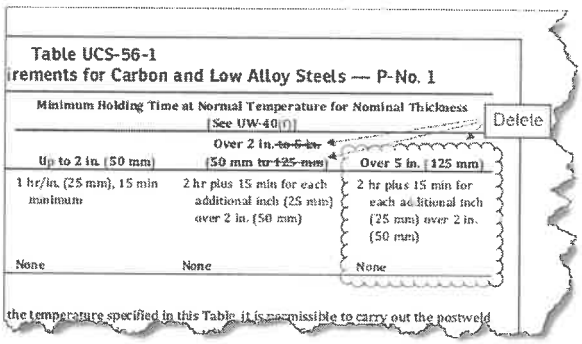

Table UCS-56-1
irements for Carbon and Low Alloy Steels — P-No. 1

Minimum Holding Time at Normal Temperature for Nominal Thickness [See UW-40(f)]		
Up to 2 in. (50 mm)	Over 2 in. ~~to 5 in.~~ (50 mm ~~to 125 mm~~)	Over 5 in. (125 mm)
1 hr/in. (25 mm), 15 min minimum	2 hr plus 15 min for each additional inch (25 mm) over 2 in. (50 mm)	2 hr plus 15 min for each additional inch (25 mm) over 2 in. (50 mm)
None	None	None

Delete

the temperature specified in this Table it is permissible to carry out the postweld

206

Section VIII, Division 1
PWHT Exemptions for Wrought or Forged Butt Weld Fittings

- A PWHT exemption is provided for circumferential butt welds in pipe or tube that satisfy thickness and carbon content limits. (See Table UCS-56-2 GENERAL NOTE (d)(2) below)
- Consideration was given to expanding this exemption for the situation where a pipe or tube is welded to a fitting such as a pipe elbow.
- This exemption was extended to circumferential butt welds between pipe, tube and wrought or forged butt weld fittings in the following Tables:
  - Table UCS-56-2
  - Table UCS-56-3
  - Table UCS-56-4

Section VIII, Division 1 2021 Edition

(d) For welding connections and attachments to pressure parts, postweld heat treatment is not mandatory under the conditions specified below:

(1) for attaching to pressure parts that have a specified maximum carbon content of not more than 0.25% (SA material specification carbon content, except when further limited by the purchaser to a value within the specification limits) or nonpressure parts with groove welds not over ½ in. (13 mm) in size or fillet welds that have a throat thickness of ½ in. (13 mm) or less, provided preheat to a minimum temperature of 200°F (95°C) is applied;

(2) for circumferential butt welds in pipe or tube where the pipe or tube have both a nominal wall thickness of ½ in. (13 mm) or less and a specified maximum carbon content of not more than 0.25% (SA material specification carbon content, except when further limited by the purchaser to a value within the specification limits);

(3) for studs welded to pressure parts that have a specified maximum carbon content of not more than 0.25% (SA material specification carbon content, except when further limited by the purchaser to a value within the specification limits), provided preheat to a

COMMON RULE VIII-2, Tables 6.9, 6.10, 6.11

207

Impact Test Exemption Temperature for B16.5 & B16.47 Flanges – *Fine-Grain Practice* - UCS-66(c)(1)(-a)

- Impact test exemption rules for standard flanges (B16.5, B16.47 and long weld neck flanges) were revised in 2019 Edition
- To qualify for -20°F (-29°C) exemption temperature, flanges must be produced to fine-grain practice and supplied in the heat-treated condition.
- Satisfying the fine-grain practice condition has proved to be a sticky point for being able to apply this exemption rule.
- The Committee approved the following intent interpretation and code revision to provide some relief to the industry:

Question: Is it the intent of Section VIII, Division 1, UCS-66(c)(1) that evidence be provided for certification to fine grain practice?
Reply: No.

Revision to UCS-66(c)(1)(-a)

A certification statement on a Material Test Report or certificate of compliance attesting to production to fine grain practice is sufficient.

Same action for VIII-2

209

Section VIII, Division 1
Clarification of UCS-85 Heat Treatment of Specimens Rules

- Item opened to address inquiry on UCS-85(i) concerning representation of prior heat treatments in test specimens
- It has been widely understood that all heat treatments carried out on materials at temperatures colder than a subsequent normalizing or austenitizing heat treatment do not need to be represented in the test specimens required by UCS-85.
- UCS-85(i) rewritten to more clearly state this requirement
- Under this same Record, Committee decided to a carry out complete editorial review of this paragraph to improve clarity of the requirements. Changes made are shown on next two slides

210

Section VIII, Division 1
Clarification of UCS-85 Heat Treatment of Specimens Rules

Record 20-1641 Public Review Draft

Existing Text:

UCS-85 HEAT TREATMENT OF TEST SPECIMENS

(a) The following provisions shall apply in addition to, or as exceptions to the general rules for heat treatment given in UG-85.

(b) Heat treatment as used in this section shall include all thermal treatments of the material during fabrication exceeding 900°F (480°C), except as exempted below.

(c) The material used in the vessel shall be represented by test specimens which have been subjected to the same heat treatments above the lower transformation temperature and postweld heat treatment except as provided in (e), (f), (g), (h), and (i) below. The kind and number of tests and test results shall be as required by the material specification. The vessel Manufacturer shall specify the temperature, time, and cooling rates to which the material will be subjected during fabrication, except as permitted in (h) below. Material from which the specimens are prepared shall be heated at the specified temperature within reasonable tolerances such as are normal in actual fabrication. The total time at temperature shall be at least 80% of the total time at temperature during actual heat treatment of the product and may be performed in a single cycle.

(d) Thermal treatment of material is not intended to include such local heating as thermal cutting, preheating, welding, torch bending, or heating below the lower transformation temperature.

Replace with "heat"

Proposed Revisions:

Revise and reformat as follows:

(c) The material used in the vessel shall be represented by test specimens ~~which have been~~ subjected to the same heat treatments ~~above the lower transformation temperature and postweld heat treatment~~ as during fabrication except as provided in (e), (f), (g), (h), and (i) below. The test specimens shall be prepared as follows:

(1) The kind and number of tests and test results shall be as required by the material specification.

(2) The vessel Manufacturer shall specify the temperature, time, and cooling rates to ~~which the material will be subjected~~ be applied during fabrication, except as permitted in (h) below.

(3) Material from which the specimens are prepared shall be heated at the specified temperature within +/- 15°F (8°C) ~~reasonable tolerances such as are normal in~~ actual fabrication.

(4) The total time at temperature shall be at least 80% of the total time at temperature applied during ~~actual heat treatment of the product~~ fabrication and may be performed in a single cycle.

Revise as follows:

(e) In excep[illegible] above and UG-

Note that this change aligns with clarification in UCS-85(i)

211

Section VIII, Division 1
Clarification of UCS-85 Heat Treatment of Specimens Rules

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(a) preheating treatment of material is not required to include such local heating as thermal cutting, preheating, welding, torch brazing, or heating below the lower transformation temperature of tubing and pipe for bending or sizing.

(e) An exception to the requirements of (c) above and UG-85 shall apply to standard nonwelded items such as described in UG-11(c) and UG-11(d). These may be subject to postweld heat treatment with the vessel or vessel part without the same treatment being required of the test specimens. This exception shall not apply to specially designed cast or wrought fittings.

(f) Materials conforming to one of the specifications listed in P-No. 1 Group Nos. 1 and 2 of Section IX, Table QW/QB-422 and all carbon and low alloy steels used in the annealed condition as permitted by the material specification are exempt from the requirements of (c) above [illegible] during [illegible]

Revise as follows:

*(e) ~~An exception to the requirements of (c) above and UG-85 shall apply to s~~*Standard nonwelded items ~~such as~~ described in UG-11(c) and UG-11(d) that are subjected to postweld heat treatment with the vessel or vessel part during fabrication do not require test specimens prepared with the fabrication heat treatment as otherwise required in (c) above and UG-85. ~~These may be subject to postweld heat treatment with the vessel or vessel part without the same treatment being required of the test specimens. This exception shall not apply to specially designed cast or wrought fittings.~~

Note that this last sentence was removed

212

Section VIII, Division 1
Clarification of UCS-85 Heat Treatment of Specimen Rules

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fication are exempt from the requirements of (c) above when the heat treatment during fabrication is limited to postweld heat treatment at temperatures below the lower transformation temperature of the steel. This exemption does not apply to SA-841.

(g) Materials listed in ~~Section IX, Table QW/QB-422~~ P-No. 1 Group No. 3 and P-No. 3 Group Nos. 1 and 2 that are certified in accordance with (c) above from test specimens subjected to the PWHT requirements of Tables UCS-56-1 through UCS-56-11 need not be recertified subjected to the alternate PWHT conditions permitted by Table UCS-56.1.

(h) The simulation of cooling rates for test specimens from nonimpact tested materials 3 in. and under in thickness is not required for heat treatments below the lower transformation temperature.

(i) All thermal treatments which precede a thermal treatment that fully austenitizes the material need not be accounted for by the specimen heat treatments, provided the austenitizing temperature is at least as high as any of the preceding thermal treatments.

Delete strikethrough text

Replace "certified " with "tested"

Replace "recertified " with "retested"

Insert "(75 mm)"

Delete and Replace with the following:

(i) All prior heat treatments applied at temperatures colder than a final heat treatment that fully austenitizes the material are not required to be included in the test specimens.

213

Section VIII, Division 1
Tables UHA-32-1 and UHA-32-2

- Note (a) of Tables UHA-32-1 and UHA-32-2 exempts welds from PWHT under certain conditions, including that the joints are completely radiographed.
- There was an inquiry asking if this RT requirement applied to corner joints. ANSWER = No
- Note (a) completely rewritten to improve clarity in both Tables

Record 21-2301 Public Review Draft

New General Note (a) for Table UHA-32-1.

(a) Postweld heat treatment is not required when conditions (1) through (4) below are met:
(1) vessels constructed of Type 410 material for SA-182 Grade F6a, SA-268, and SA-479
(2) having a carbon content not exceeding 0.08 %
(3) welded with electrodes that produce
a. an austenitic chromium-nickel weld deposit or
b. a non-air-hardening nickel-chromium-iron weld deposit
(4) for nominal thicknesses
a. not exceeding 3/8 in. (10 mm) or
b. exceeding 3/8 in. (10 mm), but not greater than 1 1/2 in. (38 mm) for full penetration welds in butt joints when
i. a preheat of 450 F (230 C) is maintained during welding and
ii. the joints are completely radiographed

214

Section VIII, Division 1 - Impact Test Exemption Temperature for Lined and Integrally Clad Plate

- Currently UCL-24 provides guidance on establishing the maximum allowable working temperature for components that are either lined or integrally clad
- There is no parallel set of rules for low-temperature design. Two paragraph added to UCL-27 to address lined and clad construction.
- UCL-27(b) - states that when an applied corrosion resistant lining is used in accordance with UCL-23(a), the impact test exemption temperature of the component shall consider the base material only.
- UCL-27(c) - states that when a corrosion resistant integral cladding is used in accordance with UCL-23(b) or UCL-23(c), the impact test exemption temperature of the component shall be the warmer of the two values determined for the base material and the integral cladding material.
  - The impact test exemption temperature for the integral cladding material shall be determined in accordance with Parts UHA or UNF as applicable.

COMMON RULE – Section VIII, Div. 2 – New paragraph 3.3.6.6 added to establish low temperature operation rules for vessels with applied lining or cladding.

215

Section VIII, Division 1
PWHT Exemption for UHT Material SA-353 and SA-553

- A joint industry research project was conducted to study whether PWHT as specified in Table UHT-56 for welded SA-553 greater than 2 in. (50 mm) thick was necessary.
- Conclusion of work was that the tensile properties. toughness and crack arrest properties of the base metal and weldments remain mostly unaffected by PWHT when the below conditions are satisfied:

Record 20-2729 Public Review Draft

UHT-82 (*k*) The PWHT as required by Table UHT-56 may be waived for SA-353 and SA-553, Type I materials with a nominal thickness over 2" (50mm), provided the following conditions are met:
(1) One of the high nickel alloy filler metal listed in UHT-82(e)(1) is used;
(2) The welding processes are limited to SMAW, SAW, GTAW and GMAW;
(3) Impact tests are performed as part of the welding procedure qualification tests as specified in UG-84. Production impact tests are performed in accordance with UG-84(i). Lateral expansions in weld metals and heat affected zones of each of the specimens shall not be less than 0.032 in. (0.8mm) for both welding procedure qualification tests and production impact tests.

216

Section VIII, Division 1
Definition of Bolt Cross Sectional Area – Appendix 2

- Definition of A_b, cross-sectional area of bolts, as given in 2-3 Notation, has been revised to align with the definition given in PCC -1 Appendix H.

A_b = Total cross-sectional area of all the bolts based on the smaller of:
a) Root diameter of the thread
b) Least diameter of any unthreaded portion

ASME PCC-1 Appendix H contains root areas for common bolt sizes.

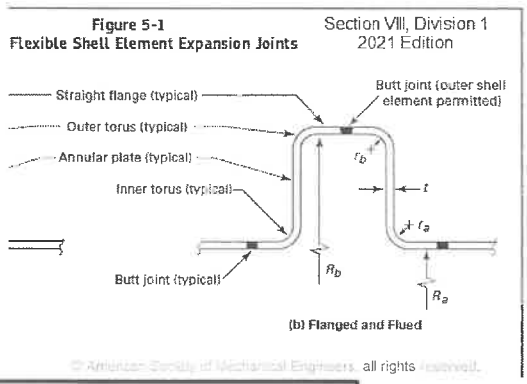
COMMON RULE – Section VIII, Division 2, Part 4.16, 4.16.13 Bolt Area

217

Section VIII, Division 1 – Short Cylinder Definition for Flexible Shell Element Expansion Joints – Appendix 5

- 5-3(f) addresses straight flanges between the inner torus and the shell and between both outer tori.
- Extended straight flanges (see Fig. 5-1) that exceed length of $0.5\sqrt{Rt_f}$ shall satisfy UG-27
- This action introduced new term, L_{limit} , that defines short cylinder effect

  L_{limit} = Maximum length where the requirements of UG-27 are not mandatory = $0.5\sqrt{Rt_f}$



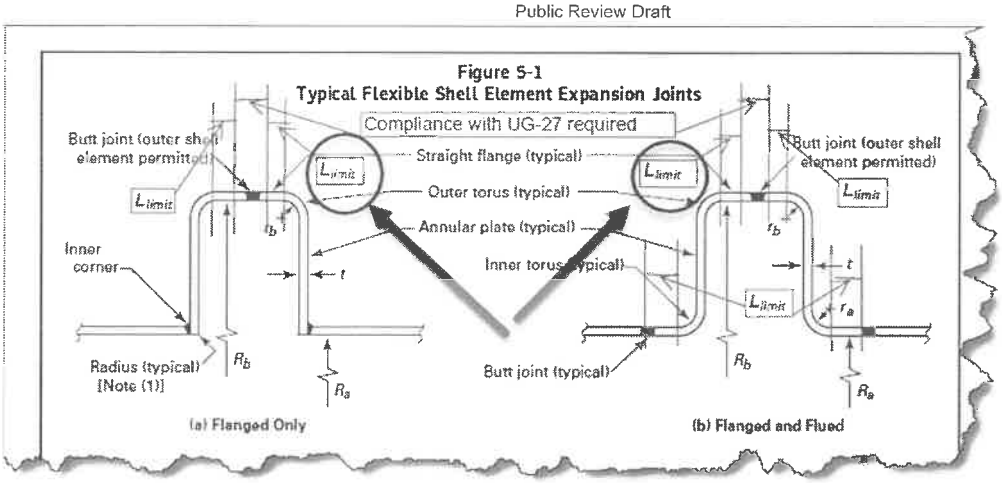
See next slide:

COMMON RULE – Section VIII, Division 2, Part 4.20, 4.20.3(d) & Fig. 4.20.1

219

Section VIII, Division 1 – Short Cylinder Definition for Flexible Shell Element Expansion Joints – Appendix 5

Record 20-758
Public Review Draft



220

Appendix 10 – Record Retention; Welder Performance Qualification Records

- With regard to welder performance qualification records, 10-13(b)(7) states:

Record 18-1027 Public Review Draft

> (7) Welder/Welding Operator Performance Qualification Records for each welder who welded on the vessel

- Some Manufacturers satisfy this requirement by having records of all welders and welding operators that were qualified during the time period that the vessel was constructed.
- The Committee wants the construction records retained for a particular vessel to list the specific welders that welded on the vessel.
- Revised Requirement: (7) Welder/Welding Operator Performance Qualification Records for only those welders/welding operators who welded on the vessel or part.

221

Appendix 10 – Record Retention; Maintenance of Welder Continuity Records

- Paragraph UW-29(d) requires the Manufacturer to maintain a record of the welders and welding operators showing the date and results of tests and the identification mark assigned to each.
- These records shall be maintained in accordance with Section IX. But must they be maintained for 3 years as part of record retention requirements of Appendix 10, 10-13?
- ANSWER: YES
- 10-13(b)(16) added

Record 21-1092 Public Review Draft

> (16) Continuity records showing that the qualifications of welders, braziers, welding operators, and grazing operators have been maintained.

COMMON RULE – Section VIII, Division 2, Annex 2-C, 2-c.3.1(d)(13) added

222

Section VIII, Division 1
Appendix 20 Hubs Machined from Plate

- As presently written, Appendix 20 rules appear to only apply to hubs machined from plate made of SA materials.
- That was not the intent; the rules should also apply to SB (nonferrous) materials.
- The following revisions were made to 20-2 to correct this oversight:

> Both specimens shall meet the ~~tensile and yield requirements of the SA-~~ mechanical property requirements of the material specification.
>
> For carbon and low alloy steels, t~~T~~he reduction-of-area shall not be less than 30%; ~~(For~~ for those materials for which the material specification requires a reduction-of-area value greater than 30%, the higher value ~~must~~ shall be met.~~)~~

223

Section VIII, Division 1
Appendix 31 – Materials Added

- Appendix 31 provides supplemental requirements for Chrome-Moly steels for which tightly controlled welding and heat treatment procedures are of particular importance.
- Fifteen additional 2 ¼ CR-Mo steels have been added to Table 31-1.

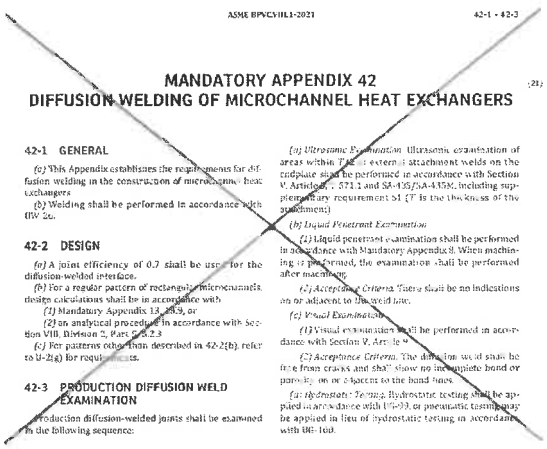
Record 13-866 Public Review Draft

Nominal Composition	Type/grade	Specification No.	Product Form
2 1/4Cr-1Mo	Grade F22, Cl. 1	SA-182	Forgings
	Grade F22, Cl. 3	SA-182	Forgings
	Grade T22	SA-213	Smls. tube
	Grade WC9	SA-217	Castings
	Grade WP22, Cl. 1	SA-234	Smls. & wld. fittings
	Grade P22	SA-335	Smls. pipe
	Grade F22, Cl. 1	SA-336	Forgings
	Grade F22, Cl. 3	SA-336	Forgings
	Grade FP22	SA-369	Forged pipe
	Grade 22, CL. 1	SA-387	Plate
	Grade 22, CL. 2	SA-387	Plate
	Grade 8, Cl. A	SA-487	Castings
	Grade B22	SA-739	Bar
	Grade 10CrMo9-10	SA/EN 10216-2	Smls. tube
	Grade 11CrMo9-10	SA/EN 10222-2	Forgings

224

Section VIII, Division 1 – Deletion of Mandatory Appendix 42 - Microchannel Heat Exchangers

- In the 2021 Edition, specific welding requirements for microchannel heat exchangers were removed from Appendix 42 since Section IX added coverage for diffusion welding.
- The remaining rules in 42-2 Design are covered elsewhere in VIII-1
- Rules for Production Diffusion Weld examination in 42-3 were moved to new paragraph UW-55
- With these changes, Appendix 42 has been removed in the 2023 Edition



ASME BPVC.VIII.1-2021 42-1 - 42-3

MANDATORY APPENDIX 42
DIFFUSION WELDING OF MICROCHANNEL HEAT EXCHANGERS

42-1 GENERAL

(a) This Appendix establishes the requirements for diffusion welding in the construction of microchannel heat exchangers.

(b) Welding shall be performed in accordance with UW-26.

42-2 DESIGN

(a) A joint efficiency of 0.7 shall be used for the diffusion-welded interface.

(b) For a regular pattern of rectangular microchannels, design calculations shall be in accordance with

(1) Mandatory Appendix 13, 13-9, or

(2) an analytical procedure in accordance with Section VIII, Division 2, Part 5, 5.2.3

(c) For patterns other than described in 42-2(b), refer to U-2(g) for requirements.

42-3 PRODUCTION DIFFUSION WELD EXAMINATION

Production diffusion-welded joints shall be examined in the following sequence:

(a) Ultrasonic Examination. Ultrasonic examination of areas within T/4 of external attachment welds on the endplate shall be performed in accordance with Section V, Articles 4, 5 [5.1.1 and SA-435/SA-435M, including supplementary requirement S1 (T is the thickness of the attachment)]

(b) Liquid Penetrant Examination

(1) Liquid penetrant examination shall be performed in accordance with Mandatory Appendix 8. When machining is performed, the examination shall be performed after machining.

(2) Acceptance Criteria. There shall be no indications on or adjacent to the weld line.

(c) Visual Examination

(1) Visual examination shall be performed in accordance with Section V, Article 9.

(2) Acceptance Criteria. The diffusion weld shall be free from cracks and shall show no incomplete bond or porosity on or adjacent to the bond lines.

(d) Hydrostatic Testing. Hydrostatic testing shall be applied in accordance with UG-99, or pneumatic testing may be applied in lieu of hydrostatic testing in accordance with UG-100.

225

Section VIII, Division 1
Appendix 44 Cold Stretching Rules – Stiffening Rings

- Appendix 44 provides rules that take advantage of the work hardening properties of austenitic stainless steels operating under cryogenic conditions
- Current rules do not address use of stiffening rings
  - Use case – horizontal vessel supported by saddles
- New Paragraph 44-5(i) added:

(i) If required to support loads, no more than two rings shall be placed inside or outside of a shell. Ring material shall be stainless steel Type specified in Table 44-4-1. Rings shall be attached to the shell by continuous double fillet weld or full penetration weld. If double fillet welds are used, proper venting shall be provided to avoid air entrapment behind weld. The distance between the centroid of the ring and any structural discontinuity shall not be less then $1.1(D_o \times t)^{0.5}$.

Where: D_o = shell outside diameter before cold stretching

t = nominal shell thickness before cold stretching

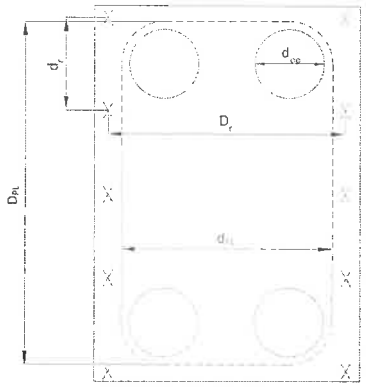
226

Section VIII, Division 1 – Appendix 45
Design of End Plates for Plate & Frame Heat Exchangers

1. Design rules for fixed and movable endplates and compression components (e.g. bolts) updated
2. Endplates may be designed per UG-34 or Appendix 46 (alternative calculations, including design-by-analysis)
   - No longer required to validate design-by-analysis by pressure test or strain test.

Section VIII, Div.1 2023 Edition

Figure 45-6.1
Typical PHE Geometry



NOTE: X denotes compression bolt location

227

Section VIII, Division 1 – Appendix 47
Editorial Corrections

- Revision to 47-3 clarifying that there is no implied minimum number of years of design experience. The Manufacturer determines what is "sufficient experience in the design of pressure vessels":
- Correction to 47-4

Record 20-1641 Public Review Draft

having an accredited program

dance with the requirements of this Appendix
sign activities performed or certified by the Man-
r. The qualification requirements shall also apply
ers, engineers, and Certifying Engineers who are
by the Manufacturer by contract or agreement
services in the design of pressure vessels.
anufacturer shall maintain a controlled docu-
ferenced in the Quality Control System, identify-
persons that may exercise control of design
rformed by others.
tifying Engineers
Certifying Engineers shall be Chartered, Regis-
r Licensed in accordance with one or more of
wing:
a) as a Registered Professional Engineer in at
e state of the United States or at least one pro-
Canada
b) with the International Register of Professional
s by an authorized member of the International
nal Engineers Agreement (IPEA)
c) with an authorized member of the Asia Pacific
c Cooperation (APEC)
d) with an authorized member of the European
on of National Engineering Associations (FEANI)
The Certifying Engineer shall have 4 yr or more of
ce in the design of pressure vessels.

47-4 QUALIFICATIONS FOR DESIGN ACTIVITY

or 47-3

Individuals engaged in design activity while under the responsible charge of an individual described in 47-2 shall

(a) be qualified to meet the following minimum re-

47-3 ALTERNATIVE QUALIFICATIONS FOR RESPONSIBLE CHARGE[79]

In lieu of the requirements of 47-2(b) or 47-2(c), the Manufacturer may implement the following alternative qualifications for the engineer or designer in responsible charge for design activities:

(a) Engineer

(1) The engineer shall have a degree from ~~an accredited~~ university or college in engineering, science, or technology requiring an equivalent of 4 yr of full-time study of higher education.

(2) The engineer shall have ~~a minimum number of years of experience~~ defined by the Manufacturer ~~in the design of pressure vessels~~.

(b) Designer. The Designer shall meet either of the following:

(1) The Designer shall have completed an accredited engineering technician or associates degree, requiring the equivalent of at least 2 yr of study, plus have ~~a minimum number of years of experience~~ defined by the Manufacturer ~~in the design of pressure vessels~~.

(2) The Designer shall have ~~a minimum number of years of experience~~ defined by the Manufacturer ~~in the design of pressure vessels~~.

sufficient experience in the design of pressure vessels as

571

228

Section VIII, Division 1 – Appendix 47
Subcontracting Design Work

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MANDATORY APPENDIX 47
REQUIREMENTS FOR PRESSURE VESSEL DESIGNERS (23)

Add a new paragraph with the following text:

"47-1(d) The person in responsible charge may be a direct employee or engaged by the Manufacturer by contract or agreement."

47-1 INTRODUCTION

(a) A designer, engineer, or Certifying Engineer (see 3-2), designated by the Manufacturer, shall be in responsible charge[1] of the design of a pressure vessel that is certified by that Manufacturer.

(b) The person in responsible charge of design activities shall be experienced as described in the use of this Division.

(c) The qualifications and experience required of a person in responsible charge of design activities will depend on the design complexity[2] of the pressure vessel and the nature of the individual's experience.

47-2 QUALIFICATION REQUIREMENTS FOR RESPONSIBLE CHARGE[79]

~~One or more persons within the Manufacturer's organization[23] shall be qualified to perform design work or exercise control of design work performed by others in accordance with the requirements of this Appendix for all design activities performed or certified by the Manufacturer.~~ The qualification requirements shall also apply to designers, engineers, and Certifying Engineers who are engaged by the Manufacturer by contract or agreement for their services in the design of pressure vessels.

The Manufacturer shall maintain a controlled document, referenced in the Quality Control System, identifying the persons that may exercise control of design

Replace the opening sentence of 47-2 with the following text:

"The Manufacturer's organization[2] shall qualify one or more persons to perform design work or exercise control of design work performed by others in accordance with the requirements of this Appendix for all design activities performed or certified by the Manufacturer.

equivalent of at least 2 yr of study, plus have a minimum of 6 yr of experience in the design of pressure vessels.

(2) The Designer shall have a minimum of 10 yr of experience in the design of pressure vessels.

(d) As an alternative to the requirements in (a), (b), or (c), the Manufacturer may follow the requirements of ASME Section VIII, Division 2, Part 2.

47-3 ALTERNATIVE QUALIFICATIONS FOR RESPONSIBLE CHARGE[79]

In lieu of the requirements of 47-2(b) or 47-2(c), the Manufacturer may implement the following alternative qualifications for the engineer or designer in responsible charge for design activities:

(a) Engineer

Revisions provide clarification concerning the Manufacturer's responsibility for design work performed by employees or outside subcontracted individuals.

Record #21-2030, Rev.1
Page 2

Replace the opening paragraph of 47-4 with the following text:

"Individuals, either direct employees or those who are engaged by the Manufacturer by contract or agreement for their services, may perform design activity while under the responsible charge of an individual described in 47-2 and 47-3 and shall"

47-4 QUALIFICATIONS FOR DESIGN ACTIVITY

~~Individuals engaged in design activity while under the responsible charge of an individual described in 47-2 shall~~

(a) be qualified to meet the following minimum requirements by the Manufacturer as described in its Quality Control System:

(1) have knowledge of the design requirements of

performing seismic reactions, designing quick-actuating closures, or being engaged in U-2(g) design activities

47-6 MANUFACTURER'S RESPONSIBILITIES

(a) The Manufacturer who employs the designer, engineer, or Certifying Engineer shall

(1) identify the minimum qualifications required for

229

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Section VIII, Division 1 Interpretations

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Presented by: Codes & Standards

230

Production Impact Test Plates for Repair Welding

- Interpretation : BPV VIII-1-20-02
- Edition: 2015
- Date Issued: 13Feb2020
- Par/Fig/Table: Mandatory Appendix 2, Fig. 2-4 (6)

Background: A standard flange conforming to one of the ASME Flange Standards defined in UG-44(b) of Section VIII Division 1 (i.e., ASME B16.5/B16.47) is being verified for its adequacy for pressure-temperature conditions beyond that specified in the respective flange standards using the Appendix 2 rules.

Question: If the standard flange geometry does not conform to all the requirements in Appendix 2, including Figure 2-4 geometry, may Appendix 2 rules be applied to a standard flange?

Reply: No.

Comment: One example where the geometry of a standard flange may not conform to App. 2 concerning the hub 1:3 taper maximum limit

231

Thickness of flat plate in UG-93(d)(4)-c)

- Interpretation : BPV VIII-1-20-04
- Edition: 2017
- Date Issued: 20March2020
- Par/Fig/Table: UG-93(d)(4)(-c) & UG-34(b)

Question: As referenced in UG-93(d)(4)(-c), is "the thickness of the flat plate such as defined in UG-34(b)" the same as "t" as defined in UG-34(b)?

Reply: Yes.

Comment: See next slide. Note that in UG-34(b). "*t*" is defined as the minimum required thickness

232

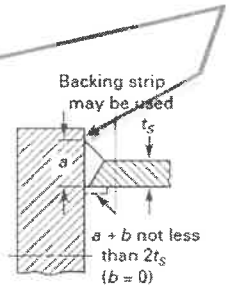
Thickness of flat plate in UG-93(d)(4)-c)

- Interpretation : BPV VIII-1-20-04
- Edition: 2017
- Date Issued: 20March2020
- Par/Fig/Table: UG-93(d)(4)(-c) & UG-34(b)

UG-93(d)(4)(-c)

(-c) the outside peripheral edge of the flat plate after welding, as shown in sketches (e-1), (e-2), (f), and (g) if the distance from the edge of the completed weld to the peripheral edge of the flat plate is less than the thickness of the flat plate such as defined in UG-34(b);

(-d) the inside peripheral surface of the flat plate [illegible] as shown in sketches (m) and (n);



(e-1)

233

Inspection Openings in the Jacket of Jacketed Vessels

- Interpretation : BPV VIII-1-20-06
- Edition: 2017
- Date Issued: 09March2020
- Par/Fig/Table: Appendix 9, 9-4(b)

Question: With reference to 9-4(b) shall the rules of UG-46 related to the number of inspection openings to be provided in the jacket of a jacketed vessel be based on the ID of the jacket?

Reply: Yes.

Comment: Per 9-4(b) "The requirements for inspection openings as prescribed in UG-46 shall apply to jackets....."

234

Welding after PWHT

- Interpretation : BPV VIII-1-20-10
- Edition: 2017
- Date Issued: 29April2020
- Par/Fig/Table: UCS-56

Question: When PWHT is not a service requirement under the rules of UW-2(a) or UCS-68, and not required by the User per U-2(a)(3), may a weld exempt from PWHT by UCS-56 be applied after optional PWHT and prior to pressure testing without repeating PWHT?

Reply: Yes.

Comment: Since the weld is exempt from PWHT and the User did not mandate PWHT be performed, nothing prohibits the fabricator from welding on the material after an optional PWHT is performed.

236

UW-50, Nondestructive Examination by UT or RT

- Interpretation : BPV VIII-1-20-18
- Edition: 2017
- Date Issued: 18June2020
- Par/Fig/Table: UW-50 and endnote 71

Background: A vessel is pneumatic tested, UT and RT is performed, MT or PT is not performed on the same welds already examined by RT or UT. The materials are ferromagnetic.

Question: Is it acceptable to perform Ultrasonic examination (UT) or Radiography examination (RT) to satisfy the nondestructive examinations required by paragraph UW-50 and endnote 71.

Reply: No.

Comment: Note that "endnote 71" is now "endnote 47" in the 2021 Edition. Endnote 47 reads: Examination shall be by magnetic particle or liquid penetrant methods when the material is ferromagnetic, or by the liquid penetrant method when the material is nonferromagnetic.

238

Tubesheet and Head Plate Thickness Requirements for PWHT

- Interpretation : BPV VIII-1-20-38
- Edition: 2017
- Date Issued: 16Nov2020
- Par/Fig/Table: UCS-56(d)(2) and UCS-56(d)(5)

Question: Does the maximum metal thickness specified in UCS-56(d)(2) and UCS-56(d)(5) apply to flat heads?

Reply: Yes.

Comment: This Q&R confirms that the phrase "shell or head material" includes flat heads and tubesheets.

Section VIII, Div. 1 2021 Edition

(d) The operation of postweld heat treatment shall be carried out by one of the procedures given in UW-40 in accordance with the following requirements:

(1) The temperature of the furnace shall not exceed 800°F (425°C) at the time the vessel or part is placed in it.

(2) Above 800°F (425°C), the rate[a] of heating shall be not more than 400°F/hr (222°C/h) divided by the maximum metal thickness of the shell or head material

239

Stiffening Ring

- Interpretation : BPV VIII-1-21-04
- Edition: 2017
- Date Issued: 31March2021
- Par/Fig/Table:

Background: A stiffening ring extends completely the outside circumference of a cylinder. A notch is made in the ring away from the shell surface and the required moment of inertia and area of the ring shell section is maintained through the notch as calculated per U-2(g).

Question: When a stiffener ring extends completely around the outside circumference of a cylinder may a notch be made in the ring away from the shell surface if the required moment of inertia and the area of the ring shell section is maintained through the notch per UG-29(b) and the design and construction details are submitted and accepted by the Authorized Inspector per U-2(g)?

Reply: Yes

Comment: The Code addresses placement of a notch adjacent to the shell surface, but not away from the shell surface. Hence, U-2(g) applies.

241

Heat Treatment of Formed Heads

- Interpretation : BPV VIII-1-21-06
- Edition: 2017
- Date Issued: 12April2021
- Par/Fig/Table: UCS-56, UCS-85, Interp BPV VIII-1-16-80, UCS-79(d)

Background: Normalized carbon steel plates are formed into heads and then subjected to an austenizing heat treatment at the same temperature of the initial normalizing.

Question (1): Must the holding time, heating and cooling rate of austenizing heat treatment meet the requirements of TABLE UCS-56-1, UCS-56(d)(2) and UCS-56(d)(5)?
Reply (1): No.

Question (2): When an austenitizing heat treatment is specified by the user or his designated agent, are the applicable details for its application such as the holding time, heat treatment temperature, and cooling rate to be provided by the user or his designated agent?
Reply (2): Yes. See U-2(a)(3).

242

Same Heat-Treated Condition

- Interpretation : BPV VIII-1-21-07
- Edition: 2017
- Date Issued: 12April2021
- Par/Fig/Table: UH-84(h)(2)(-b)

Question (1): Is the "same heat-treated condition" stated in paragraph UG-84(h)(2)(-b) referring to the procedure qualification test material and the production material being subjected to similar post weld heat treatments?
Reply (1): No.

Question (2): Does paragraph UG-84(h)(2)(-b) require the heat-treated condition of the procedure qualification test plate, prior to welding, be in the same heat-treated condition of production material, prior to welding?
Reply (2): Yes.

Comment: Note that Q&R (2) will be reflected in the revised UG-84(h) in the 2023 Edition.

243

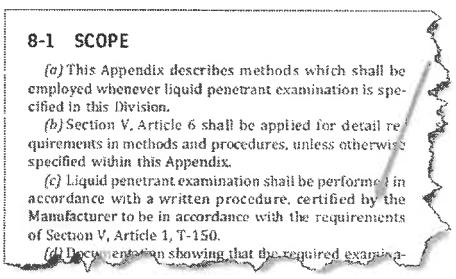
Code Compliance Certification of Liquid Penetrant Written Procedure by others than the Manufacturer

- Interpretation : BPV VIII-1-21-11
- Edition: 2019
- Date Issued: 18may2021
- Par/Fig/Table: Appendix 8, 8-1(c)

Question: Does it meet the requirements of Mandatory Appendix 8, para. 8-1(c) if the liquid penetrant examination written procedure followed by a subcontractor who is performing liquid penetrant examinations, is certified in accordance with Section V, Article 1, T-150 by the subcontractor or by other than the Manufacturer?

Reply: No

Comment: Per 8-1(c) the Manufacturer of the vessel must certify the written procedure in accordance with Section V, Article 1, T-150.



Section VIII, Div. 1 2021 Edition

8-1 SCOPE

(a) This Appendix describes methods which shall be employed whenever liquid penetrant examination is specified in this Division.

(b) Section V, Article 6 shall be applied for detail requirements in methods and procedures, unless otherwise specified within this Appendix.

(c) Liquid penetrant examination shall be performed in accordance with a written procedure, certified by the Manufacturer to be in accordance with the requirements of Section V, Article 1, T-150.

(d) Documentation showing that the required examina-

244

Production Coupon

- Interpretation : BPV VIII-1-21-12
- Edition: 2017
- Date Issued: 18June2021
- Par/Fig/Table: UG-84(i)

Question: For a given vessel, a production impact test plate meeting the requirements of UG-84(i) for a Cat A joint is welded using a WPS containing three welding processes. All three of the welding processes on the WPS were used to make the weld deposit and the requirements of UG-84(h)(5) were met. If another Cat. A or Cat. B joint exists in this vessel and was welded using the same WPS, but only with one of the welding processes listed, is an additional production impact test plate required?

Reply: No.

Comment: UG-84(i)(3) requires that separate production impact test plates be made for Cat A and B joints when the WPS is different. A given WPS can be written with more than one welding process. It is also permissive to use only one welding process in a procedure in production when multiple processes are listed.

It is believed that "each welding procedure" implies each welding process or same set of essential and supplementary essential variables in a given procedure, since this has been permissive practice in Section IX for a very long time.

245

Scope

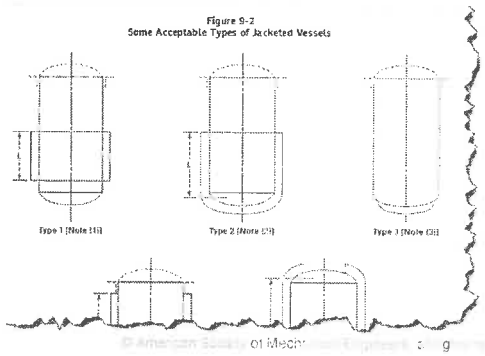
- Interpretation : BPV VIII-1-21-13
- Edition: 2019
- Date Issued: 20Sept2021
- Par/Fig/Table: Appendix 9, 9-1, Fig. 9-2

Question: Does Appendix 9 place any requirements on the orientation of the vessel?

Reply: No.

Comment: The inquirer, observing that the vessel configurations presented in Figure 9-2 appear to be in the vertical orientation, asked if the rules of Appendix 9 were applicable solely to vertical vessels.

Section VIII, Div. 1 2021 Edition



246

UW-51(a)(4), Appendix 12; Section VIII, Division 2 (2013 Edition), 7.5.5.- Ultrasonic Examination Acceptance Criteria

- Interpretation : BPV VIII-1-13-2
- Edition: 2013
- Date Issued: 10Jan2023
- Par/Fig/Table: UW-15(a)(4)

Question: An ultrasonic examination of a weld is performed in accordance with Section VIII, Division 1, Appendix 12. May the acceptance criteria of Section VIII, Division 2, paragraph 7.5.5 referenced in paragraph UW-51(a)(4) of Section VIII, Division 1, be applied in lieu of that provided in Appendix 12?

Reply 1: No.

Question 2: An ultrasonic examination of a weld is performed in accordance with Section VIII, Division 2, paragraph 7.5.5 referenced in paragraph UW-51(a)(4). May the acceptance criteria of Section VIII, Division 1, Appendix 12 be applied in lieu of that provided in 7.5.5?

Reply 2: No.
Comment: It appears that ASME failed to publish this Interpretation when it was approved in October 2013. The Q&R's clarify that you cannot mix and match manual UT and automated UT requirements.

247

Fine Grain Practice for ASME B16.5 and B16.47 Flanges, and Long Weld Neck Flanges

- Interpretation : BPV VIII-1-23-01
- Edition: 2021
- Date Issued: 10Feb2023
- Par/Fig/Table: UCS-66(c)(1)

Question: Is it the Intent of Section VIII, Division 1, UCS-66(c)(1) that numeric evidence (such as in SA-20 8.3) be provided for certification to fine grain practice?

Reply: No.

Comment: This interpretation has an associated code revision approved under Record 22-1550. Also, same interpretation issued for Section VIII, Division 2: BPV VIII-2-23-01.

249

Opening Reinforcement

- Interpretation : BPV VIII-1-23-02
- Edition: 2019
- Date Issued: 09March2023
- Par/Fig/Table: UG-36(c)(3)

Question: In meeting the requirements of UG-36(c)(3) regarding "rapid fluctuations in pressure", does Section VIII Division 1 make a distinction between internal and external pressure?

Reply: No.

Comment: UG-36(c)(3) concerns small openings exempt from reinforcement. These rules do not apply to vessels subject to *rapid fluctuations in pressure*. The Committee's position is that the term "pressure" can be either internal or external pressure.

250

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Section VIII Code Cases

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251

Case 3035 – Minimum Thickness of Standard Fittings under UW-16(f)(3)(-a)(-6)

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- In UW-16(f)(3)(-a) fittings not exceeding NPS 3 (DN 80) may be attached to vessels by a fillet weld deposited from the outside only without any additional reinforcement.
- In UW-16(f)(3)(-a)(-6) the minimum wall thickness for fittings shall not be less than that required by UG-45 or that shown in Table UW-16.1 plus the thickness added for corrosion allowance.
- In General Note for Table UW-16.1, for fittings having a specified OD not equal to the OD of equivalent standard NPS size as listed in the Table, then the next largest NPS size and thickness shall be chosen.
- This causes a problem for B16.11 threaded couplings that do not have a defined OD based on NPS size. Net result is that you have to select a higher class fitting.

Section VIII. Div. 1 2021 Edition

Table UW-16.1
Minimum Thickness Requirements for Fittings {21}

NPS (DN)	in.	mm
¼ (6)	0.11	2.7
⅜ (8)	0.11	2.7
⅜ (10)	0.11	2.7
½ (15)	0.14	3.6
¾ (20)	0.16	4.2
1 (25)	0.22	5.5
1¼ (32)	0.30	7.5
1½ (40)	0.30	7.5
2 (50)	0.31	7.9
2½ (65)	0.37	9.5
3 (80)	0.38	9.5

GENERAL NOTE: For fittings having a specified outside diameter not equal to the outside diameter of an equivalent standard NPS (DN) size, the NPS (DN) size chosen from the table shall be one having an equivalent outside diameter larger than the fitting's outside diameter.

Next slide

252

Case 3035 – Minimum Thickness of Standard Fittings under UW-16(f)(3)(-a)(-6)

- Case 3035 provides an alternative to the UW-16(f)(3)(-a)(-6) rule
- The thickness of a standard fitting shall not be less than the nominal thickness of an ASME B16.11 Class 3000 threaded coupling as shown in Table 1
- Example: NPS 1

Table UW-16.1 t = 0.22 In.

CC3035 Table 1 t = 0.218

Under current UW-16(f) rule, this CL3000 coupling would not be acceptable.

Case 3035

Table 1
Class 3000 Coupling Nominal Thickness

NPS, in.	Coupling O.D., In.	Pipe O.D., In.	Thickness, In.
⅛	0.62	0.405	0.108
¼	0.75	0.540	0.105
⅜	0.89	0.675	0.103
½	1.12	0.840	0.140
¾	1.38	1.050	0.165
1	1.75	1.315	0.218
1¼	2.25	1.660	0.295
1½	2.5	1.900	0.300
2	3.00	2.375	0.313
2½	3.62	2.875	0.373
3	4.25	3.50	0.375

253

Case 3036 Alternative Requirements for Certifying Engineer Qualification – Section VIII, Divisions 1 & 2

- Case 3036 permits engineers from within Central and South America to be able to carry out the duties of a Certifying Engineer.
- Engineer shall have a minimum of 8 years experience in the design or PV's
- Engineer shall have received authority to perform engineering work from a licensing or registering authority.
- The jurisdictions where the vessel design and manufacturing takes place and the jurisdiction of the location of installation shall be within Central and South America.
- Effort underway to expand the case beyond Latin America under Record 22-77.

ASME BPVC.CC.BPV.S4-2021

CASE
3036

Approval Date: January 6, 2022

Code Cases may not remain available for use unless annulled by the applicable Standards Committee.

Case 3036
Alternative Requirements for Certifying Engineer Qualification
Section VIII, Division 1; Section VIII, Division 2

Inquiry: As an alternative to the requirements of Section VIII, Division 1, Mandatory Appendix 47, 47-2(a)(1) or Section VIII, Division 2, Annex 2-J, 2-J.3.2(c), under what conditions may an engineer chartered, registered, or licensed within the jurisdictions where the vessel design and manufacturing take place and the jurisdiction of the location of the installation, be qualified as a Certifying Engineer?

Reply: It is the opinion of the Committee that in lieu of the requirements of Section VIII, Division 1, Mandatory Appendix 47, 47-2(a)(1) or Section VIII, Division 2, Annex 2-J, 2-J.3.2(c), the following requirements may be used:

(a) The engineer shall be employed by the user. For Division 2 applications, the engineer shall attest in writing that they understand and meet the requirements of the ASME Code of Ethics.

(b) The engineer shall have received authority to perform engineering work from licensing or registering authorities.

(c) The engineer shall identify the locations and the licensing or registering authorities under which they have received the authority to perform engineering work.

(d) The engineer shall comply with the requirements of the locations to practice engineering where the vessel design and manufacturing take place, and the requirements of location of the installation.

(e) The engineer shall provide evidence showing that engineers in the jurisdictions where the vessel design and manufacturing take place, and the jurisdiction of

254

Material Code Cases – Section VIII, Division 1

▪ Case 3058 – Ni-Cr-Mo-Cu Alloy UNS N06235	ASTM B166-19 bar and rod
	ASTM B366-20 fittings
	ASTM B168-19 plate
	ASTM B167-18 seamless pipe and tube
	ASTM B619-19 welded pipe and tube
	ASTM B626-19 welded pipe and tube
▪ Case 3056 – Ni-25Cr-20Co UNS N07740	ASTM B637-21 bar, forgings
	ASTM B872-19 plate, sheet & strip
	ASTM B983-21 seamless alloy pipe & tube
	ASTM B1007-21 welded tube
	ASTM B366-20 wrought fittings

255

Material Code Cases – Section VIII

- Case 3052 (VIII-1 & VIII-2) EN 10216-3:2013 Grade P690QL2 – Fine-Grain seamless steel tube
  EN 10028-6:2017 Grade P690QL2 – Fine-Grain flat products
- Case 3047 – Use of Carbon Steel Pipe without Requirement Bend or Pressure Testing – SA-53/SA-53M Type E, Grade A
- Case 3043 (VIII-2) – Use of ASME B16.47-2020 Lieu of ASME B16.47-2017 [Approved 1April2022]
- Case 3043 (VIII-1) – Use of ASME B16.47-2020 Lieu of ASME B16.47-2017 [Approved 1April2022]
- Case 3037 – Use of 1.15Ni-0.65Cu-Mo-Cb (UNS K21001) High-Strength Low-Alloy Steel Seamless Pipes and Tubes, Flat Products, Forgings, and Fittings

256

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Section VIII, Division 2 Major Revisions

HSB - Global Inspections and Engineering Services

Presented by: Codes & Standards

257

VIII-2 Certifying Engineer Changes

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- Section VIII Standards Committee continues to promote use of Section VIII, Division 2 for construction of custom engineered vessels.
- The number of PV's constructed to VIII-2 versus VIII-1 still very low
- Feedback on reasons why VIII-2 is not used always points to requirements for certification of UDS & MDR by a Certifying Engineer, that is challenging outside North America
- Changes to VIII-1 in E19 & E21 defined specific examples when a Certifying Engineer must be used, which is significantly less than VIII-2
- For E23, Committee took action to reduce the frequency when a Certifying Engineer must certify a UDS or MDR

258

VIII-2 Certifying Engineer (CE) Changes

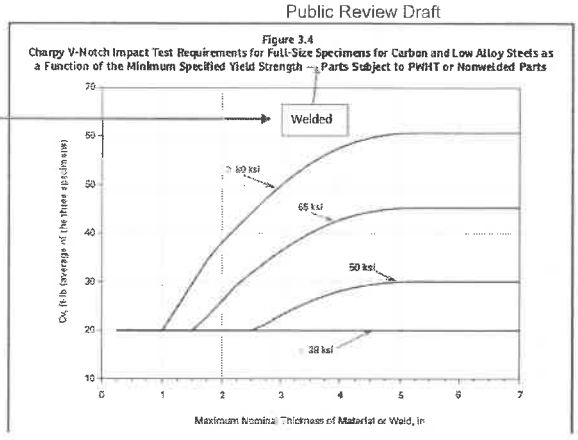
- 2.2.1 Certification of UDS for Class 1 & 2 now only required when the user provides data required by 2.2.3.2(f)(1) or 2.2.3.1(f)(2) to perform a fatigue analysis.
  - Mandatory certification of UDS for Class 2 removed
- 2.3.3 Mandatory certification of MDR by CE removed for Class 2 construction.
- For E23, Certification of MDR by a CE only required for Class 1 & 2 when any of the following design activities are performed:
  - Fatigue analysis
  - Use of Part 5 to determine thickness of pressure part when design rules are not provided in Part 4
  - Use of Part 5 to establish design thickness in lieu of Part 4 specified in 4.1.1.5.2
  - Use of Part 4.8 to design a quick-actuating closure
  - Dynamic analysis
- For all other cases, MDR shall be certified by the engineer/designer in responsible charge.

259

Section VIII, Division 2 - Editorial Clarification to Toughness Rules Relative to Parts Subject to PWHT

1. Impact test requirements vary based on whether or not welded parts are subject to PWHT
2. This action add the word "Welded" in front of the phrase: "Parts Subject to PWHT" as a reminder that the toughness benefits associated with postweld heat treatment only applies to welded parts.
3. This change affected:
   - Figures 3.3/M, 3.4/M, 3.7M, 3.8/M
   - Tables 3.12, 3.13
   - Paragraphs 3.11.2.1(b), 3.11.2.3(a), 3.11.2.5(a), 3.11.7.6.2(b)(2), 3.11.2.9(b)

Record 15-2810
Public Review Draft



260

Section VIII, Division 2

Table 4.2.3 Definition of Material Types for Welding and Fabrication Requirements

- Revision corrects assignments to Material Type 1;
- Only SA-387 Grade 12 of P-No. 4, Group 1 should be assigned to Material Type 1

Table 4.2.3
Definition of Material Types for Welding and Fabrication Requirements

Material Type	Description
1	• P-No. 1 Groups 1, 2, and 3 • P-No. 3 Group 3 except SA-302 • P-No. 4 Group 1 only SA-387 Grade 12 and SA/EN 10028-2 Grade 13CrMo4-5 • P-No. 8, Groups 1 and 2 • P-No. 9A Group 1
2	Materials not included in material Types 1, 3, and 4
3	Quenched and tempered high strength steels (see Table 3-A.2) except SA-372 Grade B and Class 70 of Grade E, F, G, H, and J when used for forged bottles
4	• P-No. 21 through P-No. 25 inclusive • P-No. 31 through P-No. 35 inclusive • P-No. 41 through P-No. 45 inclusive

P-No. 4, Group 1, only
SA-387 Grade 12 and SA/EN
10028-2 Grade 13CrMo4-5

Record 20-1723
Public Review Draft

261

Section VIII, Division 2
Horizontal Vessel On Saddle Calculations – Part 4.15

- Corrections are made to Part 4.15, Figure 4.15.3 sketch (c) concerning stiffening ring spacing
- Revise "x_1" to "x_2" and dimension line for "a" in Figure 4.15.4 sketch (a). [See Next Slide]

Section VIII, Div. 2 2021 Edition

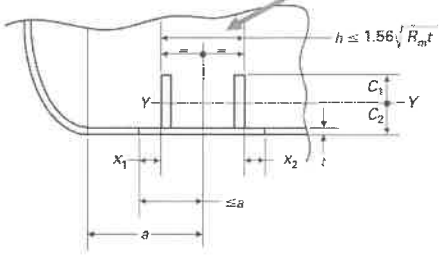
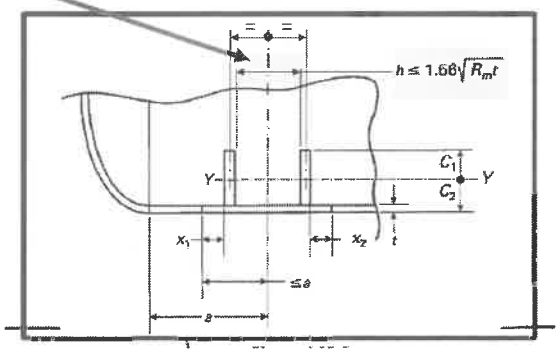


Fig. 4.15.3

(c)

Record 21-1364 Public Review Draft

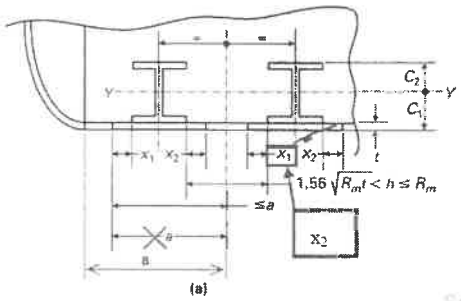


262

Section VIII, Division 2
Horizontal Vessel On Saddle Calculations – Part 4.15

- Revise "x_1" to "x_2" and dimension line for "a" in Figure 4.15.4 sketch (a).

Record 21-1364 Public Review Draft

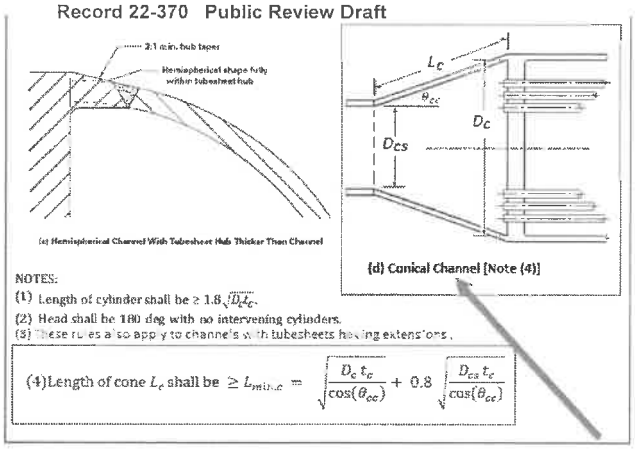


263

Section VIII, Division 2– Concentric Conical Sections Welded to Tubesheets – 4.18.4(f)

- New conical channel rules shall be used when the concentric cone is attached to the tubesheet and there are no cylindrical sections between the cone and the tubesheet.
- The half-apex angle , θ_{cc}, shall not be greater than 60 degrees.

Record 22-370 Public Review Draft

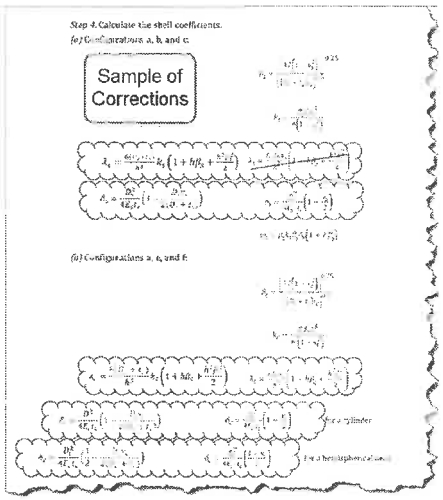


264

Section VIII, Division 2
Update to Tubesheet Design Rules

- Revisions to U-Tube, Fixed and Floating tubesheet design rules
- Many of the revisions are based on recommendations from ASME PTB-7 - 2014 "Criteria for Shell-and-Tube Heat Exchangers According to Part UHX of ASME Section VIII, Division 1"

Record 22-370
Public Review Draft



265

Section VIII, Division 2
Fatigue Screening – Method B

- Not all pressure vessels subject to cyclic operations require a fatigue analysis.
- Paragraph 5.5.2 provides three fatigue screening methods to determine if a fatigue analysis is required.
  - Experience with comparable equipment
  - Method A – Limited to material with specified min. tensile strength ≤ 552 Mpa (80,000 psi)
  - Method B – Simpler screening procedure; can be used for all materials.
- The Committee recently reviewed Method B and found it can produce non-conservative results when compared to a full elastic fatigue analysis.
- 5.5.2.4 Method B completely rewritten

266

Section VIII, Division 2 - Re-write of DBA Rules for Protection Against Collapse from Buckling

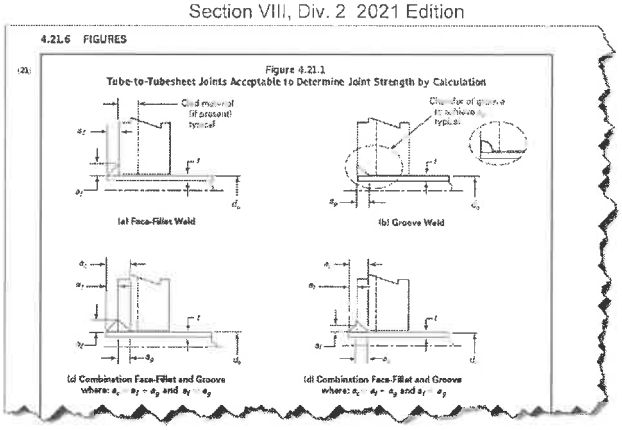
- Consideration of buckling failure modes due to external pressure or other compressive loads is covered in Part 4.4 (Design-by-Rule) and Part 5.4 (Design-by-Analysis)
- Current Part 5.4 rules provide three options for evaluating protection against collapse from buckling (Types 1, 2 and 3).
  - Very little background information available for current Part 5.4 rules
  - Current Part 5.4 rules also will produce overly conservative results when compared to Part 4.4 calculations.
- Part 5.4 is completely rewritten, and now provides step-by-step instruction for use of two methods to evaluate protection against collapse from buckling
  - Method 1 – Elastic (eigenvalue) buckling analysis
    - Primarily intended for evaluation of individual components (e.g. heads, cylinders, cones, etc.)
  - Method 2 – Elastic-Plastic buckling analysis
    - No limit on applicability

267

Section VIII, Div. 2 – Joint Category F – Tube-to-Tubesheet Welds

1. Joint Category F defined in 4.2.5.7 to cover welded joints connecting tubes to tubesheets. Previously assigned to joint category D.
2. Rules for tube-to-tubesheet joints given in Part 4.21
3. Table 7.2 revised ; for all Examination Groups 100% MT or PT now required.

Section VIII, Div. 2 2021 Edition



268

Section VIII, Div. 2 Part 8, 8.2.4 & 8.2.5
Examine vs. Inspect

1. Code intent:

   "examine, examination" relates to an activity performed by an employee of the Manufacturer

   "inspect, inspection" relates to an activity performed by the Authorized Inspector

Record 18-2112
Public Review Draft

- In VIII-2 pressure test procedures, terms "examining, examination" incorrectly used. The AI performs the inspection for leakage.

- NOTE: In 8.2.4(c), the test pressure must be reduced prior to the AI performing the leak inspection.

8.2.4 TEST PROCEDURES

(a) The metal temperature during a pressure test shall be maintained at least 17°C (30°F) above the minimum design metal temperature of the vessel, but need not exceed 50°C (120°F), to minimize the risk of brittle fracture.

(b) The test pressure shall not be applied until the vessel and the test fluid are at about the same temperature.

(c) The test pressure shall be gradually increased until the test pressure has been reached. For pneumatic tests, the test pressure shall be increased in steps of approximately one-tenth of the test pressure until the test pressure has been reached. The pressure shall then be reduced to a value not less than the test pressure divided by $y_{S1/S2}$ before examining for leakage in accordance with 8.2.5.

INSPECTION

inspecting

8.2.5 TEST EXAMINATION AND ACCEPTANCE CRITERIA

inspection

(a) Following the reduction of the test pressure to the level indicated in 8.2.4(c), a visual examination for leakage shall be made by the Inspector of all joints and connections and of all regions of high stress such as knuckles of formed heads, cone-to-cylinder junctions, regions around openings, and thickness transitions. Visual examination of the vessel may be waived, provided all of the following requirements are satisfied:

inspection

(1) A suitable gas leak test is applied, 8.3.2.

(2) Substitution of the gas leak test is by agreement between the Manufacturer and Inspector.

(3) All welded seams that will be hidden by assembly are given a visual examination for workmanship prior to assembly.

269

Section VIII, Division 2
Valves Installed in Pressure Gage Line during Pressure Test

- Currently 8.1.4(a) states that pressure gauges used during pressure tests shall be connected directly to the vessel.
- However, it is not uncommon to connect the indicating pressure gage to a pressure line that then connects to the vessel.
- What is implied is that there shall be no intermediate valves placed between the indicating gage and the pressure vessel.
- 8.1.4 revised as follows:

> Pressure gages used in testing vessels shall be indicating pressure gages and shall be connected directly to the vessel or with a pressure line that does not include intermediate valves.

270

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Section VIII, Division 2 Interpretations

HSB - Global Inspections and Engineering Services

Presented by: Codes & Standards

271

Nozzle Taper for Heavy Barrel Forgings Detail 7, Table 4.2.13

HSB

- Interpretation : BPV VIII-2-21-02
- Date Issued: 31March2021
- Edition: 2017
- Par/Fig/Table: Table 4.2.13 Detail 7

Question: For Section VIII, Div. 2 Class 1 and Class 2 vessels with openings in shells designed in accordance with the rules of para.4.5 with reference to Nozzle Detail 7 in Table 4.2.13, is it permitted to reduce the heavy-barrel neck taper angle to less than 45° ?
Reply 1: No.

Question 2 : For Section VIII, Div. 2 Class 2 vessels with openings in shells designed in accordance with Part 5, with reference to Nozzle Detail 7 per Table 4.2.13, is it permitted to reduce the heavy-barrel neck taper angle below 45° ? Reply: Yes.

Comment: 4.5.1 Scope states: The rules in 4.5 are applicable for the design of nozzles in shells and heads subjected to internal pressure, external pressure, and external forces and moments from supplemental loads as defined in 4.1. Configurations, including dimensions and shape, and/or loading conditions that do not satisfy the rules of this 4.5 may be designed in accordance with Part 5.

272

Calculation of Forming Strains for Elbow

- Interpretation : BPV VIII-2-21-04
- Edition: 2015
- Date Issued: 23April2021
- Par/Fig/Table: Table 6.1

Question: Does 6.1.2.3(d) require an elbow formed from a plate to be evaluated to determine its extreme fiber elongation?

Reply 1: Yes.

Question 2: Does Table 6.1 provide a specific formula for calculating the extreme fiber elongation of the formed elbow?

Reply 2: No.

Comment: This is not a standard method for forming an elbow, which is typically formed from a thick wall pipe segment. Options are to either perform a design analysis, or carry out a post-forming heat treatment if the forming strain cannot be accurately determined.

273

Closure Bar Calculation

- Interpretation : BPV VIII-2-21-07
- Edition: 2017
- Date Issued: 26Oct2021
- Par/Fig/Table: Table 4.11.1 Detail 6

Question: When using Table 4.11.1 Detail 6 to attach a jacket-to-closure member, is it the intent of Section VIII, Division 2 that the closure bar thickness and jacket spacing meet the equations shown in Detail 6, in addition to already meeting those shown in other Details (e.g. 4 or 5)?

Reply: No.

Comment: This interpretation has an associated code revision approved under Record 20-2489 in the 2023 Edition. This revisions aligns the VIII-2 rules with VIII-1.

274

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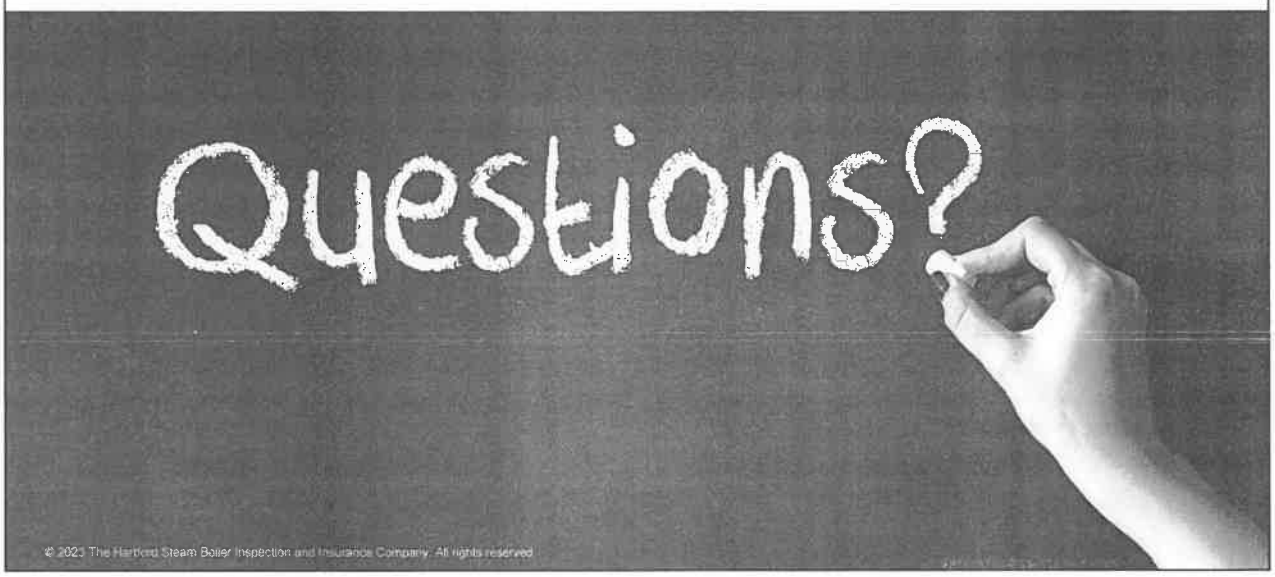

Case 3047

HSB
A Munich Re company

ASME BPVC.CC.BPV.SA-2021

CASE 3047

Approval Date: June 4, 2022

Case 3047
Use of Carbon Steel Pipe Without Requiring Bend or Pressure Testing
Section VIII, Division 1

Inquiry: Under what conditions may the requirements for bend testing and pressure testing of SA-53/SA-53M for Type E, Grade A pipe be waived for Section VIII, Division 1 construction?

Reply: It is the opinion of the Committee that the requirements for bend testing and pressure testing of SA-53/SA-53M for Type E, Grade A pipe may be waived for Section VIII, Division 1 construction, provided the following additional requirements are met.

(a) This Case only provides an exemption to the SA-53/SA-53M, sections 8 and 10 requirements; all other requirements of SA-53/SA-53M for Type E, Grade A shall be met.

(b) The pipe shall only be used for bolting elements of a multibolted cover.

(c) The maximum pipe diameter shall be NPS 2 (DN 50), and the maximum nominal wall thickness shall be 0.154 in. (3.91 mm).

(d) The pipe shall not be bent in fabrication.

(e) The maximum design metal temperature shall be 650°F (343°C).

(f) The minimum design metal temperature (MDMT) shall be no colder than -50°F (-46°C). The material in this Case shall be considered to be P-No. 1 Group No. 1 material for the purpose of impact test exemption per UCS-66(d).

(g) The allowable stress and external pressure chart assignment shall be in accordance with Section II, Part D, Table 1A for SA-53/SA-53M Type E, Grade A. The yield and tensile strengths used for design shall be in accordance with Section II, Part D, Tables U and Y-1 for SA-53/SA-53M Type E, Grade A.

(h) All physical properties shall be those for carbon steels with $C \leq 0.30\%$ in Section II, Part D, Subpart 2.

(i) Welding procedure and performance qualification shall be conducted in accordance with Section IX.

(j) All other requirements of Part UCS shall apply.

(k) This Case number shall be shown on the material marking and documentation and on the Manufacturer's Data Report.

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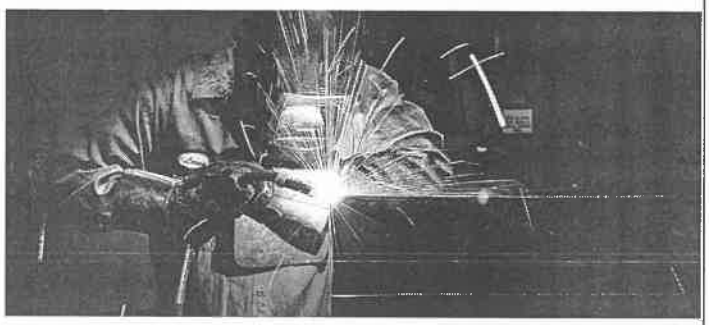
Section IX Code Revisions



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284

Liquid Penetrant Examinations, PT Examiners QW-195

HSB

- This change was initiated as a response to confusion in the industry as to whether the PT examiners performing examinations in accordance with QW-195 are required to be qualified per the rules of Section IX or not.
- The changes (see across) now provide criteria in new paragraph QW-195.3 for qualifying personnel preforming PT examinations which are essentially the same as those found in Section I and Section VIII Div. 1.
- There are corresponding revisions in QW-195, QW-193.1.2, QW-216(a), and QW-382.1(c) which reference QW-195.3.

Record 19-1681
Public Review Draft

The organization shall certify that personnel performing liquid penetrant examinations meet the following minimum requirements:
(a) Have vision, with correction if necessary, to enable the reading of a Jaeger Type No. 2 Standard Chart at a distance of not less than 12 in. (300 mm). They shall also be capable of distinguishing and differentiating contrast between colors used. These requirements shall be checked annually.
(b) Are competent in the techniques of the liquid penetrant examination method for which they are certified. This includes making the examination and interpreting and evaluating the results. Where the examination method consists of more than one operation, the examiner may be certified as being qualified only for one or more of these operations.

285

Welding Operator Continuity, QW-322

Change detail

- The last sentence of second paragraph has been revised to clarify that:
  - welding operators who use machine welding maintain qualifications **for both machine and automatic welding,** when machine welding is performed during the 6-month period of effectiveness.
  - but a welding operator who only uses automatic welding **only maintains qualifications for automatic welding.**
- Also see interpretation IX-23-13

ASME Section IX, 2021 Edition

QG-109.2 Definitions

- ***welding, automatic***: welding with equipment which performs the welding operation without adjustment of the controls by a welding operator. The equipment may or may not perform the loading and unloading of the work. See also machine welding.
- ***welding, machine***: welding with equipment that has controls that can be adjusted by the welding operator, or adjusted under the welding operator's direction, in response to changes in the welding conditions. The torch, gun, or electrode holder is held by a mechanical device. See also welding, automatic.

287

Preparation of Procedure Qualification Records and Procedure Specifications

- QG-101, QW-101, QW-200.1, QW-200.1(b), QW-200.2, QB-200.1(b), QB-200.2, QF-201(b) and QF-201.5
- Historically Section IX has stated that:
  - QW-200.1 Each organization shall prepare written Welding Procedure Specifications…
  - Similar words are included for brazing and plastic fusing procedures.
- In Interpretation IX-18-47, the Section IX endorsed the acceptability of ***procedure and performance*** qualification records being prepared by a subcontracted entity.
- The words stating the ***procedure qualification record or procedure specification*** is **"prepared by the organization"** have been deleted.
- ***But;***
  - ***It does not relieve the Organization of requirements for:***
    - ***Supervision of welding of test coupons per QG-106, or***
    - ***Certification of records as required for procedure or performance qualification records.***
      - ***These activities are still not permitted to be contracted out.***

288

Procedure Qualifications made prior to 1962, QG-108

- QG-108 addresses procedure and performance qualifications made to prior editions of the Code
- Previously:
  - Joining procedures, procedure qualifications, and performance qualifications that were made in accordance with Editions as far back as the 1962 Edition may be used in any construction for which the current Edition has been specified.
  - Older qualifications were permitted if the requirements of the 1962 Edition or later were met.
- Now - Procedure qualifications made in accordance with earlier Editions or Addenda may be used to support procedure specifications written to later Editions and Addenda ***provided the essential and, when required, supplementary essential variables*** specified by the later Editions or Addenda ***were addressed on the previously qualified procedure qualification records***.
- Regardless, as required by QG-100(b), the qualification requirements of the referencing code, standard, or specification shall be met.

289

Title, Table QW/QB-422

- Table title is revised to "Base Metal P-Numbers".
- Additionally, a web link is included with the title to a searchable source data table which is used to generate the published table.
  - This will offer users the ability to search for material grades which have been assigned a P-Number **ahead of the assignment being published in the next Code edition.**
- There is a corresponding revision in QW-421.1 and J-100 in Mandatory Appendix J.

Record 22-1476
Public Review Draft

replace text

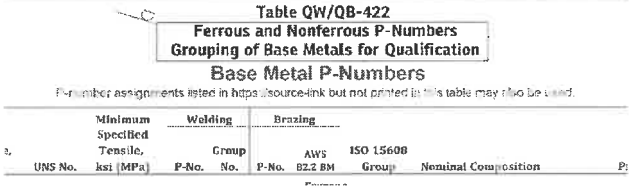


Table QW/QB-422
Ferrous and Nonferrous P-Numbers
Grouping of Base Metals for Qualification

Base Metal P-Numbers

P-number assignments listed in https://source-link but not printed in this table may also be used.

UNS No.	Minimum Specified Tensile, ksi (MPa)	Welding P-No.	Welding Group No.	Brazing P-No.	Brazing AWS B2.2 BM	Brazing ISO 15608 Group	Nominal Composition	P

290

Brazing P-Numbers, Table QW/QB-422

- In the Table title block, the column listed under Brazing P-No. in the 2021 edition has been deleted along with the column title AWS B2.2 BM.
- This action does away with listing both the Section IX P-No. and the AWS B2.2 base metal number and makes ASME Brazing P-Numbers the same as those given in AWS B2.2.
- An explanation is provided in revised paragraph QW-421.3(a).
- Actions you should be looking for:
  - (1) **BPS updated with the new P-Numbers.**
  - (2) **BPQ should be addended with the new P-Number, see QB-200.2(c).**

    Addended BPQ should be recertified and dated by the Organization.

Record 22-2233
Public Review Draft

Delete

Table QW/QB-422
Ferrous and Nonferrous P-Numbers
Grouping of Base Metals for Qualification

Delete

UNS No.	Minimum Specified Tensile, ksi (MPa)	Welding P-No.	Welding Group No.	Brazing P-No.	Brazing AWS B2.2M	Brazing ISO 15608 Group	Nominal Con
				Ferrous			
...	58 (400)	1	1	101	100	11.1	C-Mn-Si
K02504	48 (330)	1	1	101	100	1.1	C
K02504	48 (330)	1	1	101	100	1.1	C
K03005	60 (415)	1	1	101	100	11.1	C-Mn
K03005	48 (330)	1	1	101	100	11.1	C

291

Spec No., Table QW/QB-422

- In the Spec. No. column, the use of the slash (/) is replaced by 'or' so A/SA will now read A or SA, similarly for B/SB will now read B or SB.
- This will clarify the differentiation between separate ASTM and ASME specifications against a single ASME specification or adopted foreign material with a slash (/) in the specification title e.g.:

  EN or SA/EN 10025-2

  GB or SA/GB 713

  IS or SA/IS 2062

  JIS or SA/JIS G3118

Record 22-188
Public Review Draft

For pages 98 through 150 replace "A/SA-" with "A or SA- "

Spec. No.	Designation, Type, or Grade	UNS No
A/SA-36	...	...
A/SA-53	E, A	K02504
A/SA-53	S, A	K02504
A/SA-53	E, B	K03005
A/SA-53	F	K03005
A/SA-53	S, B	K03005
A/SA-105	...	K03504
A/SA-106	A	K02501
A/SA-106	B	K03006
A/SA-106	C	K03501
A/SA-106	...	...
A/SA-108	1015	G10150

For pages 151 through 174 replace "B/SB-" with "B or SB- "

Spec. No.	Alloy, Type, or Grade	UNS No.
B16.22	...	C23000
B16.50	...	C10200
B16.50	...	C12000
B16.50	...	C12200
B16.50	...	C23000
B/SB-26	T6	A03560
B/SB-26	T71	A03550
B/SB-26	...	A24430
B/SB-42	...	C10200
B/SB-42	...	C12000

292

Miscellaneous, Table QW/QB-422

Thirteen (13) new materials added.

Eight (8) Non-US materials had the minimum tensile values for customary units revised, conversions from MPa to ksi are rounded to the nearest 0.5 ksi.

A or SA-240 UNS S32101 for thicknesses > 0.187 in. (5 mm), minimum tensile values for customary and metric units revised.

Eighteen (18) were editorially corrected for the identified Product Forms.

A/SA-691 Grade 91, UNS number changed from K91560 (no longer active) to K90901.

Eighteen (18) Grades for A or SA-182 and five (5) grade for A or SA-240 had nominal thickness limits revised.

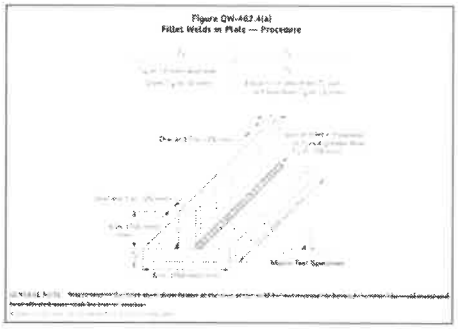
A or SA-182 18 grades, deleted "in." from 'Nominal Thickness Limits' column of thicker, so "> 5 in. (125)" now reads as "> 5 (125)", and added '≤ 5 (125)' for the nominal thickness range to thinner materials.

293

Procedure Qualification – Fillet Welds Figure QW-462.4(a), QW-181.1

- Three changes:
  - Original general note deleted. The note exceeded the requirements of QW-183(a) which addresses visual examination.
  - New general note added to permit substitution of a tube or pipe for the horizontal plate.
    - Certain applications, attachments are longitudinally welded to tubes using fillet welds.
    - QW-181.1 requires that test configurations 'shall' conform to the figures, so these welds had to be qualified as a mockups per QW-181.1.1, resulting in more restrictive qualification ranges.
    - This change allows these configurations to be qualified as a fillet weld **(see Table QW-451.3)**.
  - Figure edited to highlight a weld on both sides of the vertical plate, with additional words added to QW-181.1. Also see interpretation IX-23-06.

Records 22-196, 20-2921, 20-1847 and 21-1017
Public Review Draft



QW-181 PROCEDURE AND PERFORMANCE QUALIFICATION SPECIMENS

QW-181.1 Procedure. The dimensions and preparation of the fillet-weld test coupon for procedure qualification as required in QW-202 shall conform to the requirements in Figure QW-462.4(a) or Figure QW-462.4(d). The test coupon for plate-to-plate shall be

Insert Text: Both sides of the vertical plate shown in Figure QW-462.4(a) shall be welded

294

Performance Qualifications, Fillet Welds QW-306

- QW-306 Qualification of Fillet Weld Performance Test
- QW-306 did not prohibit using multiple weld processes in a single fillet performance qualification test and then subsequently switching or removing one of the processes.
  - In this case the process that was used for the root weld of the fillet in the performance test may not be that used in production. This change eliminates the possibility that the weld process that is used in production was not subject to the fracture test at the root required as part of the performance coupon examination.
  - **It clearly states now that a combination of weld processes may only be used in a groove weld test coupon, not on a fillet coupon.**

295

GMAW/FCAW, Mode of Transfer Table QW-255, QW-409.30 & QW-403.10

- Deleted the Essential Variable QW-409.2 for **Procedure** and **add a new nonessential variable QW-409.30.**
  - QW-409.30: At least one of the following transfer modes shall be specified:
    - (a) short-circuiting
    - (b) globular
    - (c) spray
    - (d) pulsed-spray
- **QW-409.2 does remain an essential variable for performance qualification.**
- QW-403.10 deleted, no longer required.
  - In the 2021 edition variables for base metal and weld metal thickness restrictions based on short circuit transfer for procedure qualification were removed form Table QW-255.

296

Shielding Gas
QW-408.2

- This is an essential variable for GMAW, FCAW, GTAW, EGW, Stud Welding, LBW and LLBW.
- There are now two conditions described:
  - the addition or omission of shielding gas, and
  - a change in the composition.
- **There is a significant change as to how a change in the composition is addressed.**
  - Previously any change in the specified percentage composition of a shielding gas mixture required requalification.
  - Now, a change in the shielding gas composition, except that, for weld consumables classified to SFA-5.18, SFA-5.20, SFA-5.28 or SFA-5.29 that include an **Oxygen Equivalent** shielding gas range designator do not require a separate qualification when the shielding gas Oxygen Equivalent is within the range listed in the classification of that electrode.
    - What is an Oxygen Equivalent shielding gas range designator?
    - ***Next Slide for an explanation***

297

Shielding Gas
QW-408.2

- Oxidation potential of the shielding gas is important for the weld metal chemical composition and properties.
  - The shielding gas oxygen equivalent (OE) is calculated as:

    OE = % oxygen + (0.5 x % carbon dioxide)
  - In the latest editions of AWS A5.18, A5.20, A5.28 and A5.29 oxygen equivalent has been adopted as an optional designator for weld wire classifications.
- The OE shielding gas range designator is determined by the requirements in the AWS A5 standards which **require bracketed testing** at both the high and low ends of an OE range before a shielding gas designator can be applied.
  - For an example: an ER70S-6 electrode is tested using:
    - 100% carbon dioxide shielding gas (OE = 50%), and
    - 96% argon/4% oxygen shielding gas (OE = 4%)
  - If it has passed all requirements for classification using these gases it would be designated as:
    - ER70S-6 OE 50/4.

continued

298

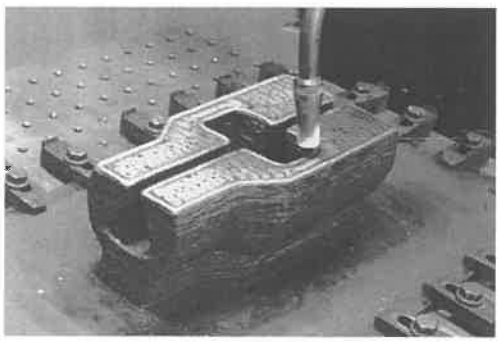
Shielding Gas
QW-408.2

- What does this mean in practice?
- For the wire classification from the previous slide (ER70S-6 OE 50/4),
  - ***a change in the shielding gas composition is permitted without requalification if the Oxygen Equivalent of the proposed shielding gas is between 4 and 50.***
  - In this example the OE 50/4 was based on two gases.
    - 100% CO_2 (OE = 50%), and 96% Ar/4% O_2 (OE = 4%)
    - What if I want to use an 80% Ar/20% CO_2 ?
      - Oxygen Equivalent value of this gas = % oxygen + (0.5 x % carbon dioxide) = 0 + 0.5 x 20 = 10
      - The value falls within the range 4 to 50 and the gas can be changed without requalification.
- **Caution:** Even though the Code permits such changes, the Manufacturer should still apply **good *Engineering Judgement*** when making such changes in terms of effects of weldability, transfer mode, weld metal properties, just because you can doesn't necessarily mean you should

299

Material Manufacturing using Wire-Additive Welding, Table QW/QB-422, QW-424.3, Article VI

- Background
  - ASME has been looking at the use of additive manufacturing in various guises over the last several years.
  - More recently, consideration has been given to the use of what is known as Direct Energy Deposition (DED) which addresses the use of wire weld consumables in conjunction with an energy source such as a laser beam or welding arc.
  - ASME PTB 13 2021 Criteria for Pressure Retaining Metallic Components Using Additive Manufacturing
    - Guidance on design, quality control, and NDE of AM components.
    - Intended to be used in conjunction with a governing design code.
    - Recommends the use of ASME Section VIII Division 2 Part 5 for design AM components.



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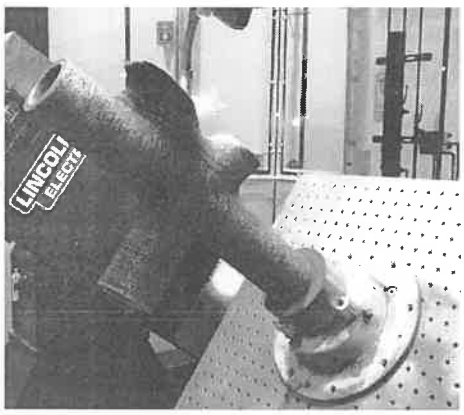
300

Material Manufacturing using Wire-Additive Welding, Table QW/QB-422, QW-424.3, Article VI

- The use for making pressure parts by wire arc AM has great interest based on several factors **but reduced lead time for components is a strong incentive**.
  - An example of this occurred early in 2022 for a replacement furnace header
  - Qualification for manufacturing the part was made to Code Case 3020, and other activities were addressed in accordance with industry standards.
  - Design supported by FEA, generated a part weight reduction of around 30%.
  - Conventional delivery was approximately ***3 months***.
  - WAAM using the GMAW process delivered the parts in just ***under 4 weeks***



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301

Material Manufacturing using Wire-Additive Welding, QG-109.2 and Article VI

- New Article VI.
  - This new section established rules for qualification of wire additive manufacturing building parts or assemblies mainly or entirely from weld metal, using filler metal in the form of a wire. **The action incorporates Code Case 3020.** Variables are specified for GMAW only.
  - New definitions have been added to QG-109.2 for the terms:
    - integrated backing,
    - bracket qualification,
    - wire-additive welding and
    - material joining processes.
  - New variables in support of Table QW-651 have been added in Article IV as QW-403.xx, QW-406.xx and QW-409.xx.

QG-109.2 new definitions:

integrated backing: Base metal that is used to support or contain the weld puddle during its deposition and remains as part of the completed weldment.

bracketed qualification: A procedure qualification performed by preparing test coupons using combinations of high and low values of specified variables to establish the upper and lower range of qualification for those variables.

wire-additive welding: The deposition of weld metal using a welding process and wire filler metal to create a new component either separately or joined to an existing component.

material joining processes: Welding, brazing or plastic fusing process, including wire-additive welding and those used to deposit overlays or cladding.

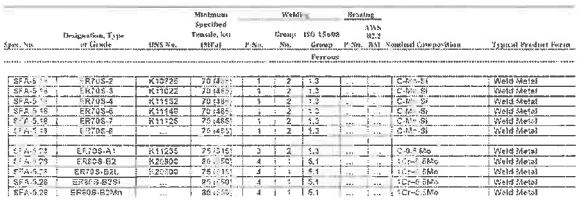
302

Material Manufacturing using Wire-Additive Welding, Table QW/QB-422 and QW-424.3

- A new Article VI (QW-600) establishes rules for the qualification of wire additive manufacturing for building parts or assemblies mainly or entirely from weld metal.
- Under action 21-945 P-Numbers have been added to Table QW/QB-422 for weld metals* from SFA-5.9, SFA-5.18 and SFA-5.28.
  - This essentially addresses additively manufactured parts made entirely from weld metal, where those parts may be further welded to other components necessitating qualification of procedures.
- An explanatory note has also been added as QW-424.3.

Records 21-945 & 22-320
Public Review Draft

QW-424.3 For base metals produced entirely from filler metal (e.g., additively manufactured base metal) the P-number or P-Number plus Group Number of the base metal may be considered that listed in QW/QB-422 for the welding consumable classification used to deposit the base metal. These materials are listed with a weld metal product form in Table QW/QB-422.



303

QG-106.4 Form QW-483 (WPQR)

Record 20-1100
Public Review Draft

QG-106.4 Group Qualification Yes___No___

(19) FORM QW-483 SUGGESTED FORMAT FOR PROCEDURE QUALIFICA
(See QW-200.2, Section IX, ASME Boiler and Pressure V
Record Actual Variables Used to Weld Test Coup

Organization Name
Procedure Qualification Record No. Date
WPS No.
Welding Process(es)
Types (Manual, Automatic, Semi-Automatic)

JOINTS (QW-402)

NOTE TO EDITOR and VOTERS: Add the text in red at the end of the 'WPS No.' line

- In the 2021 edition of Section IX a new paragraph, QG-106.4, permits the group qualification of welding procedures.
- This is allowed when permitted by the Code of Construction.
  - NBIC Part 3 already addresses this, Section I and VIII Div. 1 will have new rules in the 2023 editions
- On requirement is that the qualification record indicates that the test was performed under the requirements of QG-106.4
- Nonmandatory Form QW-483 for documenting PQRs is modified to add a field to show when the group procedure qualification rules of QG-106.4 have been applied.

304

Radiographic criteria for rounded indications QW-191.1.2

- Thickness designates as *"t"* and then used in place of 'thickness' through the balance of the paragraph and sub paragraphs.
- The term 'slag inclusion' has been changed to 'indication'.
- A new subparagraph (b)(1), titled *"Rounded Indications"* inserted to define the acceptance standards for relevant (rounded) indications:
  - The acceptance standards have been aligned with those found in Sections I, III and VIII Div. 1.
- New subparagraph (b)(2), titled *"Maximum Size of Rounded Indications"* is a restructuring and revision of the former subparagraphs (b)(1), (b)(2) and (b)(3).

Record 21-2531, Public Review Draft

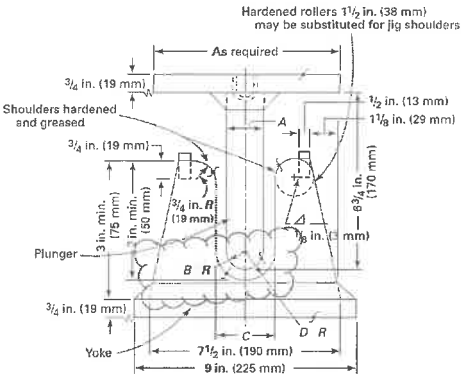
which has a length greater than
(-a) 1/8 in. (3 mm) for ~~thicknesses~~ *t* up to 3/8 in. (10 mm), inclusive
(-b) 1/3*t* ~~the thickness when the thickness is~~ for *t* greater than 3/8 in. (10 mm) ~~to~~ through 2¼ in. (57 mm), inclusive

length of the longest imperfection in the group.
(b) Rounded Indications.
(1) Relevant Indications. Only those rounded indications which exceed the following dimensions shall be considered relevant:
(-a) 1/10*t* for *t* less than 1/8 in. (3 mm);
(-b) 1/64 in. (0.4 mm) for *t* equal to 1/8 in. through 1/4 in. (3 mm to 6 mm), inclusive;
(-c) 1/32 in. (0.8 mm) for *t* greater than 1/4 in. through 2 in. (6 mm to 50 mm), inclusive;
(-d) 1/16 in. (1.5 mm) for *t* greater than 2 in. (50 mm).
(2) Maximum Size of Rounded Indications.
(-a) The maximum permissible dimension for rounded indications shall be 20% of *t* ~~the thickness~~ or ⅛ in. (3 mm), whichever is smaller.
(-b) For welds in material less than ⅝ in. (3

Bend Test Radii QW-162.1 and Figure QW-466.1

- An interpretation question (IX-23-16) was submitted regarding bend testing of welds between two different materials with different required bend radii per Figure QW-466.1 and QW-162.1:
- **Question** :Is it the intent of QW-162.2 that when a bend test is performed on a coupon joining base metals requiring different bend radii, the greater maximum bend radius may be used?

  Reply: Yes.
- As a result, a revision to QW-162.1 has been made. At the end of the last paragraph the following words have been added:
  - **When a bend specimen is tested from a coupon joining base metals having different B values, the larger of the two B values may be used.**

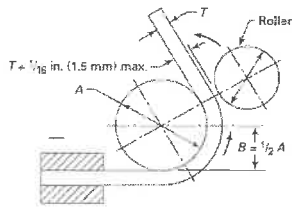


Wrap Around Bend Tests
QW-162.1 and Figure QW-466.3

- In Figure QW-466.3 general Note (d) deleted.
- QW-162.1, at the end of the second paragraph, the words of former General Note (d) of Figure QW-466.3 have been added.
- The words state that for wrap around bend tests, bending is considered complete once the outer roller has moved a minimum of 180° from its starting point.

Record 20-2628, Public Review Draft

Figure QW-466.3
Guided-Bend Wrap Around Jig



GENERAL NOTES:
(a) See Figure QW-466.1 for jig dimensions and other general notes.
(b) Dimensions not shown are the option of the designer. The essential consideration is to have adequate rigidity so that the jig parts will not spring.
(c) The specimen shall be firmly clamped on one end so that there is no sliding of the specimen during the bending operation.
(d) ~~Test specimens shall be removed from the jig when the outer roll has been removed 180 deg from the starting point.~~

Delete General Note (d)

307

Supplementary & Nonessential Variables
QW-409.4, QW-410.9, Tables QW-253, QW-254, QW-255, QW-256, QW-257 and QW-259.

- "QW-409.4 and QW-410.9 were revised in the 2021 in the relevant QW-250 tables to be shown as a supplementary essential variable as well as a nonessential variable.
- This change was made to address cooling rate variables when toughness testing was required for P-No. 8, P-Nos. 21 through 26, and P-Nos. 41 through 49.
- The change, in conjunction with revisions to the relevant paragraphs (see next slide), meant that the variables were no longer non-essential for these P-Numbers.
- The changes for 2023 restores the paragraphs to their previous wording and adds new variables to address the rules as they were intended as Supplementary Essential Variables.

Record 21-1567, Public Review Draft

QW-409 Electrical Characteristics	.4	⊕	Current or polarity	—	X
	.8	⊕	I & E range		X
QW-410 Technique	.1	⊕	String or weave		X
	.5	⊕	Method cleaning		X
	.6	⊕	Method back gouge		X
	.9	⊕	Multiple to single pass/side	—	X
	.25	⊕	Manual or automatic		X
	.26	⊕	Peening		X
	.61		Use of thermal processes	X	

New Variables		Essential	Supplementary Essential	Nonessential
QW-409	.XXX		X	
QW-410	.XXX		X	

continued

308

Supplementary & Nonessential Variables

QW-409.4, QW-410.9, Tables QW-253, QW-254, QW-255, QW-256, QW-257 and QW-259.

- QW-409.4 and QW-410.9 have had the words deleted that were added in 2021.
- QW-409.xx is added to address changes in polarity when toughness testing is required.
- QW-410.xx addresses changes form multiple passes per side to single pass per side when toughness testing is required.
- In both cases P-No. 8, P-Nos. 21 through 26, and P-Nos. 41 through 49 are exempted these requirements.
- Tables QW-253, QW-254, QW-255, QW-256, QW-257 and QW-259 have been updated.

Record 21-1567, Public Review Draft

(21) **QW-409.4** A change from AC to DC, or vice versa; and in DC welding, a change from electrode negative (straight polarity) to electrode positive (reverse polarity), or vice versa. ~~This variable does not apply to a WPS qualified for welding base metals that are assigned to P-No. 8, P-Nos. 21 through 26, and P-Nos. 41 through 49.~~

QW-410 multiple passes tomatic welding process, a change in width, frequency, or dwell time of oscillation technique. (21)

QW-410.8 A change in the contact tube to work distance.

QW-410.9 A change from ~~multi~~pass per side to single pass per side. ~~This variable does not apply for any of the following conditions:~~ (21)

~~*(a)* WPS is qualified with a heat treatment above the upper transformation temperature.~~

~~*(b)* WPS is for welding austenitic or P-10H material and is qualified with a solution heat treatment.~~

~~*(c)* Base metals are assigned to P-No. 8, P-Nos. 21 through 26, and P-Nos. 41 through 49.~~

QW-409.XXX A change from AC to DC, or vice versa; and in DC welding, a change from electrode negative (straight polarity) to electrode positive (reverse polarity), or vice versa. This variable does not apply to a WPS qualified for welding base metals that are assigned to P-No. 8, P-Nos. 21 through 26, and P-Nos. 41 through 49.

QW-410.XXX A change from multiple passes per side to single pass per side. This variable does not apply for any of the following conditions:
(a) WPS is qualified with a heat treatment above the upper transformation temperature.
(b) WPS is for welding austenitic or P-10H material and is qualified with a solution heat treatment.
(c) Base metals are assigned to P-No. 8, P-Nos. 21 through 26, and P-Nos. 41 through 49.

309

WPQ, Manual & Semi-Automatic Laser Beam Welding (LBW)
Table QW-35X & Form QW-484A for Performance Qualification

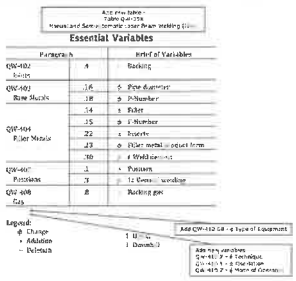
- LBW has historically been considered a machine or automatic welding process.
- Handheld LBW welding equipment for manual or semi-automatic applications have been developed.
- A new Table QW-35X along with four new QW-410 variables is included.
- Form QW-484A revised to include new qualification variables.

Records 21-2338 & 21-347, Public Review Draft

Filler metal or electrode classification(s) (info. only) ____
Filler metal F-Number(s) ____
Consumable insert (GTAW, PAW, LBW) ____
Filler Metal Product Form (QW-404.23) (GTAW or PAW) ____
Deposit thickness for each process ____
Process 1 _____ 3 layers minimum ☐ Yes ☐ No ____
Process 2 _____ 3 layers minimum ☐ Yes ☐ No ____
Position(s) ____
Vertical progression (uphill or downhill) ____
Type of fuel gas (OFW) ____
Use of backing gas (GTAW, PAW, GMAW, LBW) ____
Transfer mode (spray, globular, or pulse to short circuit-GMAW) ____
GTAW current type and polarity (AC, DCEP, DCEN) ____
For LBW or LLBW ____
Type of Equipment ____
Technique (Keyhole LBW or Melt in) ____
Torch Controlled Oscillation ☐ Yes ☐ No ____
Mode of Operation (Pulsed or Continuous) ____

RESULTS

Visual examination of completed weld (QW-302.4) _____
Transverse face and root bends [QW-462.3(a)] Longitudinal bends [Q



310

Laser Beam Welding
Table QW-264

- In Table QW-264, for Base Metals Essential variable based on P-Number has been deleted and replaced with a variable based on a change in the Base Metal.
- The change is reflected in a new variable QW-403.xx.
  - While the new variable is based a change in base metal P-No., additionally for P-No. 1 through P-No. 7 and P-No. 9A through P-No. 15F and increase in Carbon Equivalent (CE) is also part of the variable.
  - This will require the CE to be recorded on the PQR and WPS.
  - Further materials used in production will need to have their CE verified for conformance with the qualified WPS.
- The equation for CE is referenced in QW-403.26, and is:

$$CE = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Ni + Cu}{15}$$

311

Oscillation for machine or automatic welding
Table QW-258 and Table QW-260

Variables first provided for Laser Beam Welding (LBW) were intentionally made restrictive while experience was gained with this process.

With new experience in 2013 QW-410.7 was revised to include a 10% tolerance in the width, frequency, or dwell time of oscillation technique for machine or automatic welding.

This changed the meaning of QW-410.7 not only for LBW, but also for other weld processes (SAW, GMAW, GTAW, PAW, EGW and LLBW) where the variable is non-essential.

Adding a tolerance for an essential variable is appropriate because the tolerance is applied to the value recorded on the PQR, but for a nonessential variable there is no starting value recorded on the PQR, so the tolerance cannot be applied.

In the 2021 edition Table QW-264 for LBW was revised to delete QW-410.7 and add a new variable QW-410.86 to address this. The wording of QW-410.7 was put back to its pre-2013 version for those processes which had oscillation as a nonessential variable and QW-410.86 included the 10% tolerance range.

This change in 2023 now makes the same revision for Electroslag Welding (ESW) and Electron Beam Welding (EBW).

312

Heat Input – Corrosion & Hard-Facing Overlays QW-409.26

- When using wide weave beads or oscillation the heat input increases.
- The current formula did not consider the width of the bead. (see Interpretation IX-20-22).
- QW-409.26 previously referenced QW-409.1 for calculating heat input except when strip type filler was being used. In the case of strip filler, a modified equation was provided which included a factor for strip width.
- Changes:
  - The reference to QW-409.1 has been deleted.
  - New equations added which include a factor for the width of the bead in a similar manor as for strip fillers.

$$\text{Heat Input (J/inch}^2\text{)(J/mm}^2\text{)} = \frac{\text{Voltage X Amperage X 60}}{\text{Travel Speed (in./min)(mm/min) x Bead Width [in. (mm)]}}$$

continued

313

Heat Input – Corrosion & Hard-Facing Overlays QW-409.26

- ***These changes will not require any further testing for procedures that have already been qualified.***
- In addition, equations are also included for:
  - Instantaneous power welding, and
  - Evaluation based on volume of weld metal in relation to the length of weld bead, and
  - Low Power Density Laser Beam Welding (LLBW).
- Variable addressed in Tables QW-254.1, QW-255.1, QW-256.1 and QW-258.1 for SAW, GMAW/FCAW, GTAW, ESW respectively.
  - For SAW, the strip filler metal is used as opposed to an oscillation.
- Rules for permitted increases of heat input remain unchanged.
- **Heat input is now specified in J/in.^{2} (J/mm^2) not as in the 2021 edition which was J/in. (J/mm).**
- ***This variable does not apply for base metals assigned to P-No. 8, P-Nos. 21 through 26, and P-Nos. 41 through 49.***

314

Plastic Fusing
Part QF

- In Table QF-254, Table QF-257, QF-405.9, Form QF-482(c), Form QF-483(c), the term "initial heating pressure" has be revised to "initial heating interfacial pressure".
  - Based on an interpretation question asking if it was the intent that the term "initial heating pressure" means "initial heating interfacial pressure?", to which the response was yes.
  - A new definition for "initial heating interfacial pressure" has been added to QG-109.2
  - The term has been revised on Form QF-482(c) to "Heat soak gauge pressure", since by definition there is no interfacial pressure during the heat soak.
- In QG-109.2 and QF-201.2(b) for Manufacturer Qualified Electrofusion Procedure Specification (MEFPS) the reference to Technical Note TN-34 has been changed to MAB-02.
  - The Plastic Pipe Institute (PPI) superseded TN-34 and replaced it with MAB-02-2017.
  - The reference can be obtained from plasticpipe.org/
- QG-109.2, several plastic fusing definitions have been revised to correct previous omissions of the term "sidewall-fusing".

315

Plastic Fusing
Part QF

- QF-222.1(e), the solution mix required for recleaning of prepared pipe has been increased from 70% to 90% isopropyl alcohol.
- QF-222.1(g) is a new paragraph which will require:
  - Electrofusion couplings and saddles to be clamped and secured to prevent movement during the joining cycle.
  - For fittings ≥ NPS 14 re-rounding clamps will be required:

    i) at the pipe ends for socket-type fittings, and

    ii) on the header at both sides of saddle fittings.

    during the joining cycle.

    Subsequent paragraphs have been relettered.
- QF-300 and QF-301.2, elements of QF-301.2 deleted and incorporated into a revised QF-300 addressing qualification of fusing operators, no technical changes.

316

Brazing
Part QB

- Tables QB-252, QB-253, QB-254, QB-255, QB-256, QB-257 and QB-432:
  - Paragraph references in titles deleted
- Table QB-451.4, title of fifth column corrected to "Section"
- Table QB-451.5, QB-452.1 and QB-452.2:
  - Figure references removed for the columns for type and number of tests

Record 21-1215, Public Review Draft

Table QB-257
Dip Brazing — Molten Metal Bath (DB)

~~[254.1~~ Essential Variables	~~[257.2~~ Nonessential Variables
QB-402.1	...

Table QB-432
F-Numbers
Grouping of Brazing Filler Metals for Procedure and

QB	F-No.
432.1	101

Table QB-452.1
…ts — Butt, Scarf, Lap, Rabbet Joints

…f Thickness of Materials …d by Test Plate or Pipe, in. (mm)	Type and Number of Test Specimens Required
	Peel, ~~Figure QB-462.3~~, or Section, ~~Figure QB-462.4~~ [Note (1)], [Note (2)], and [Note (3)]
Max.	
2T	2

Table QB-451.4
…d Section Tests — Rabbet Joints

…e of Thickness of …rials Qualified by …Plate or Pipe, in. (mm)	Type and Number of Test Specimens Required	
	Tension [Note (1)]	~~Tension~~ [Note (2)]
Max.		

Section

317

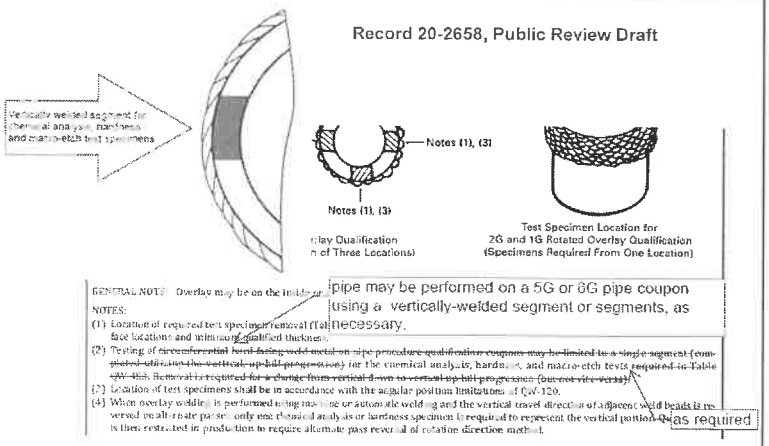
Brazing
Part QB

- QB-161.2 - editorial correction, in the last sentence the word 'second' replaces 'first' regarding subsize surface bends.
- QB-211 - editorial correction, in the second paragraph, last sentence the word 'using' replaces 'in' regarding pipe qualifying plate brazing but not vice versa.
- QB-212 - editorial correction, sentence rewritten in its entirety to read:
  - When using workmanship coupons to qualify a brazing procedure, the test coupon shall be brazed using the joint design to be used in construction.
- QB-322 –
  - Title revised to address expiration and revocation of performance qualifications as well as renewal.
  - Last paragraph of QB-322, split into new section QB-322.1 and rewritten for clarity regarding renewal of expired qualifications.

318

Test Locations Pipe, Corrosion & Hard-facing Overlay Figure QW-462.5(b)

- Note (2) revised,
  - Deleted reference to the essential variable for progression which is already addressed in QW-405.4(d).
  - Revised first sentence of the note to state that test specimens for qualification of overlay procedures may be removed from a single 180-degree vertically welded segment of the pipe.



319

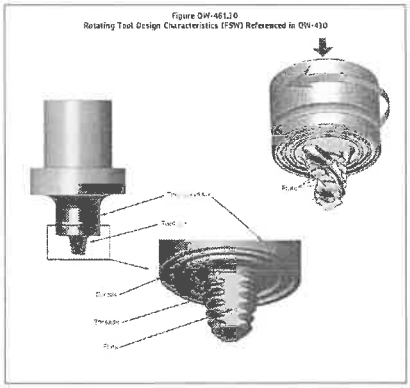
Applied Linings QW-218.2

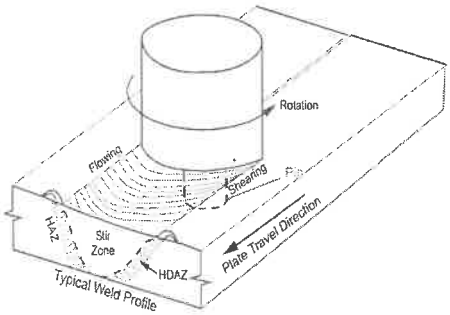
- Third sentence of paragraph revised:
  - Previously a qualification tests was required for each production welding position, except that qualification in the vertical uphill progression shall qualified for all positions.
  - Now, Qualification in any position qualifies the procedure for all positions.
    - Historically the vertical uphill progression has always been considered as the highest heat input welding position. Opinion now is that Heat Input can be varied regardless of welding position.
    - QW-409.26 addresses heat input in relation to dilution and remains an essential variable for CRO and HFO qualifications.

320

Friction Stir Welding (FSW) QW-361(e)

- Words revised to exclude Friction Stir Welding from this variable.
  - It was never intended that this variable applied to FSW.
  - Misinterpretation had users applying it however, as FSW is stated as a version of Friction Welding in the definitions.
  - The requirements for continuous drive and inertia drive welding do not apply to FSW.





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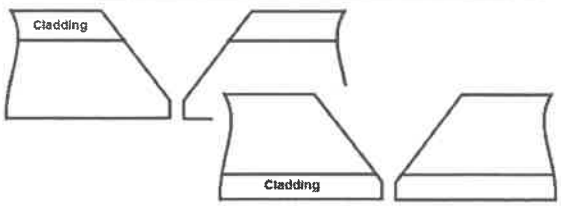
ML12157A592 Welding Technology Module 2B

321

Qualification of Clad Materials, QW-217(b)(2)

- QW-217 previously did not address qualification of clad material where the cladding is on the root surface and is required to be welded from one side only.
- In cases where the cladding is not included in the design calculations, there are two options permitted:
  1. Separate qualification for base metal and cladding according to QW-202.2 may be performed, or
  2. Qualification in accordance with the existing Method A with the following exceptions:
     a. Tension tests shall not contain any cladding.
     b. Tension acceptance per the base metal.
     c. Cladding chemical analysis if required per QW-216.2(d)

- Method A
  - Test coupon shall be clad material – Same Core P-No. plus cladding
  - Thickness ranges based on base metal and cladding deposited thicknesses per QW-451
  - Tension and bend tests to include both base metal and cladding.
  - Tension test acceptance based on base metal.



322

Welders and Welding Operators Qualified Simultaneously to (EN) ISO 9606-1 / ISO 14732 and Section IX

- Nonmandatory Appendix L
- It had become apparent that this Nonmandatory Appendix was being misinterpreted by Code Users who believed that it permitted welders and welding operators qualified only to ISO 9606-1 / ISO 14732 to weld in ASME projects without being separately qualified in accordance with Section IX and that already issued ISO certificates may be transcribed to ASME Section IX and used without any further actions.
- The whole appendix has been reworked in the first instance to make it clear that the welders and welding operators are qualified ***simultaneously*** to (EN) ISO 9606-1 / EN ISO 14732 and Section IX, additionally
  - The WPS followed does not specifically need to be qualified to Section IX.
  - Supervision and control per QG-106 is added.
  - For volumetric inspection Radiographic examination technique shall satisfy QW-191.1, ultrasonic examination technique shall satisfy QW-191.2, and the NDE personnel qualification and certification shall satisfy QW-191.4. This is a change from allowing ISO 9606-1 or ISO 14732 as being considered as meeting the requirements of Section IX.

323

HSB

A Munich Re company

Section IX Interpretations

HSB - Global Inspections and Engineering Services

Presented by: Codes & Standards

324

GTAW Weld Thickness with Repaired Portion Deposited IX-23-01

- **Background**
  - A WPS and a welder are qualified for a maximum deposit thickness of 12 mm using GTAW.
  - That welder deposits 5 mm of weld metal in the root of a 30 mm thick single vee-groove weld following that WPS.
  - The weld is completed by a second welder following a different WPS using a different welding process.
  - A flaw is discovered in the weld metal deposited by the second welder. The repair cavity is 10 mm deep from the cap.

325

GTAW Weld Thickness with Repaired Portion Deposited IX-23-01

Standard Designation:	BPV Section IX
Edition/Addenda:	2017
Para./Fig./Table No:	QW-202.3, QW-451.1, QW-452.1(b)
Subject Description:	BPV IX - 2017: QW-202.3, QW-451.1, QW-452.1(b), GTAW Weld Thickness with Repaired Portion Deposited
Date Issued:	02/09/2023
Record Number:	20-2494
Interpretation Number :	BPV IX-23-01
Question(s) and Reply(ies):	Question: Is the first welder qualified to fill the 10 mm deep cavity using GTAW following same WPS that he used to deposit the root thickness. Reply: No.

326

QW-310.2 and QW-402.4, Welds with Backing IX-23-03

Standard Designation:	BPV Section IX
Edition/Addenda:	2015
Para./Fig./Table No:	QW-310.2 and QW-402.4
Subject Description:	BPV IX - 2015: QW-310.2 and QW-402.4, Welds with Backing
Date Issued:	02/09/2023
Record Number:	21-1360
Interpretation Number :	BPV IX-23-03
Question(s) and Reply(ies):	Question: Is a welder who qualified welding a single sided groove weld on backing qualified to deposit a double sided groove weld with or without backgouging the first pass in accordance with the qualified WPS? Reply: Yes

Background: A welder was qualified by welding a single sided groove weld on backing and needs to deposit a double-sided groove weld in production. The documents governing construction do not require back gouging of double-sided welds.

327

QW-387, Tube-to-Tube Sheet Qualification IX-23-04

Standard Designation:	BPV Section IX
Edition/Addenda:	2021
Para./Fig./Table No:	QW-387
Subject Description:	BPV IX - 2021: QW-387, Tube-to-Tube Sheet Qualification
Date Issued:	02/09/2023
Record Number:	21-1445
Interpretation Number :	BPV IX-23-04
Question(s) and Reply(ies):	Question 1: In QW-387(c)(1)(-a) do the words "hole pattern" refer to ligament size in QW-402.31 only? Reply 1: Yes Question 2: Is QW-387(c)(1)(-b) an essential variable for tube-to-tubesheet performance qualification of welding operators when the Code of Construction per QW-387(a) requires testing to QW-193.2? Reply 2: No

Also reference Sec IX interpretation record # 14-1571.

328

QW 404.12, Requalification on Change of Trade Name IX-23-05

Standard Designation:	BPV Section IX
Edition/Addenda:	2019
Para./Fig./Table No:	QW 404.12
Subject Description:	BPV IX - 2019: QW 404.12, Requalification of Procedure on Change of Trade Name
Date Issued:	02/09/2023
Record Number:	21-1790
Interpretation Number :	BPV IX-23-05
Question(s) and Reply(ies):	Question: For E9018-G electrodes procured with fully defined mechanical and chemical properties, is requalification required for a change in trade name for applications requiring toughness testing? Reply: Yes

329

QW-150, Form QW-483, Type of Failure for Tensile test IX-23-08

Standard Designation:	BPV Section IX
Edition/Addenda:	2019
Para./Fig./Table No:	QW-150 of Form QW-483
Subject Description:	BPV IX - 2019: QW-150 of Form QW-483, Type of Failure for Tensile test
Date Issued:	02/09/2023
Record Number:	21-1963
Interpretation Number :	BPV IX-23-08
Question(s) and Reply(ies):	Question: Is it a requirement of Section IX that the the failure type and break location of the tensile test specimens be recorded on the PQR, or on other documents that are retained by the Certificate Holder, when the actual tensile test results are recorded on the PQR? Reply: No

- A similar interpretation (IX-83-26, Question 2) asked a question about the dimensions of the tensile specimens, which again the response indicated they were not required to be recorded.

330

QG-106.3, Employee with designated responsibility IX-23-09

Standard Designation:	BPV Section IX
Edition/Addenda:	2019
Para./Fig./Table No:	QG-106.3
Subject Description:	BPV IX - 2019: QG-106.3, Employee with designated responsibility
Date Issued:	02/09/2023
Record Number:	21-2354
Interpretation Number :	BPV IX-23-09
Question(s) and Reply(ies):	Question: When a group performance qualification is conducted under the rules of QG-106.3, may a participating organization subcontract their QG-106 representative having designated responsibility for performance qualifications? Reply: No.

331

QG-106.1(c), Organizational Responsibility IX-23-20

Standard Designation:	BPV Section IX
Edition/Addenda:	2021
Para./Fig./Table No:	QG-106.1(c)
Subject Description:	BPV IX - 2021: QG-106.1(c), Organizational Responsibility
Date Issued:	02/13/2023
Record Number:	22-1251
Interpretation Number :	BPV IX-23-20
Question(s) and Reply(ies):	Question: May a subcontractor use a contractor's WPS, when the two companies are not under the same corporate ownership, but operational control is described in their qualify programs? Reply: No

332

QW-404.5(e), SAW Weld Metal Chemical Composition
IX-23-24

Standard Designation:	BPV Section IX
Edition/Addenda:	2021
Para./Fig./Table No:	QW-404.5(e)
Subject Description:	BPV IX - 2021: QW-404.5(e), SAW Weld Metal Chemical Composition Determination
Date Issued:	02/13/2023
Record Number:	22-1660
Interpretation Number :	BPV IX-23-24
Question(s) and Reply(ies):	Question: Are both a chemical analysis from the procedure qualification test coupon and from a supplier's certificate of conformance required for A-number determination? Reply: No

333

QW-351, Coupon Thickness
IX-23-28

Standard Designation:	BPV Section IX
Edition/Addenda:	2019
Para./Fig./Table No:	QW-351
Subject Description:	BPV IX - 2019: QW-351, Coupon Thickness
Date Issued:	02/13/2023
Record Number:	22-776
Interpretation Number :	BPV IX-23-28
Question(s) and Reply(ies):	Question 1: For welder performance qualifications, is it permissible to record the actual coupon thickness on the WPQ? Reply 1: Yes Question 2: For welder performance qualifications, is it permissible to record the the nominal coupon thickness on the WPQ? Reply 2: Yes

334

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Section IX Code Cases

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335

Code Case 3002
Use of Explosion Welding Process for Tube Plugging

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- Provides rules for the qualification of welding procedures and welding operator performance.
- Only allowed when permitted by the referencing code, standard, or specification.
- NBIC interpretation15-04 noted that explosive welding of plugs into leaking heat exchanger tubes was considered a repair.
- In the 2023 edition of NBIC Part 3, a new Routine Repair is added:
  - 6) Plugging of heat exchanger tubes ¾ in. (19 mm) outside diameter and smaller when explosion welding is used as the method of plugging tubes.

336

Code Case 3003
Qualification Corner Joints Using Laser Beam Welding (LBW)

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Section IX and IV Code Case

Current qualification rules for LBW weld of corner joints are not workable as the equipment used for welding does not lend itself to making simple groove welds in plate.

The Code Case allows qualification of the WPS by use of a burst test to verify mechanical strength.

Additionally, four cross-sections from an identical test assembly to that burst tested shall be removed, polished, and etched with a suitable etchant to reveal the weld and heat-affected zone.

The Code Case is limited metals assigned to P-No. 7, grades UNS S44400, UNS S43035, and UNS S43932 and to those assigned to P-No. 8, P-No. 45, and P-No. 10H, including combinations of these metals.

Partial penetration welds are permitted.

337

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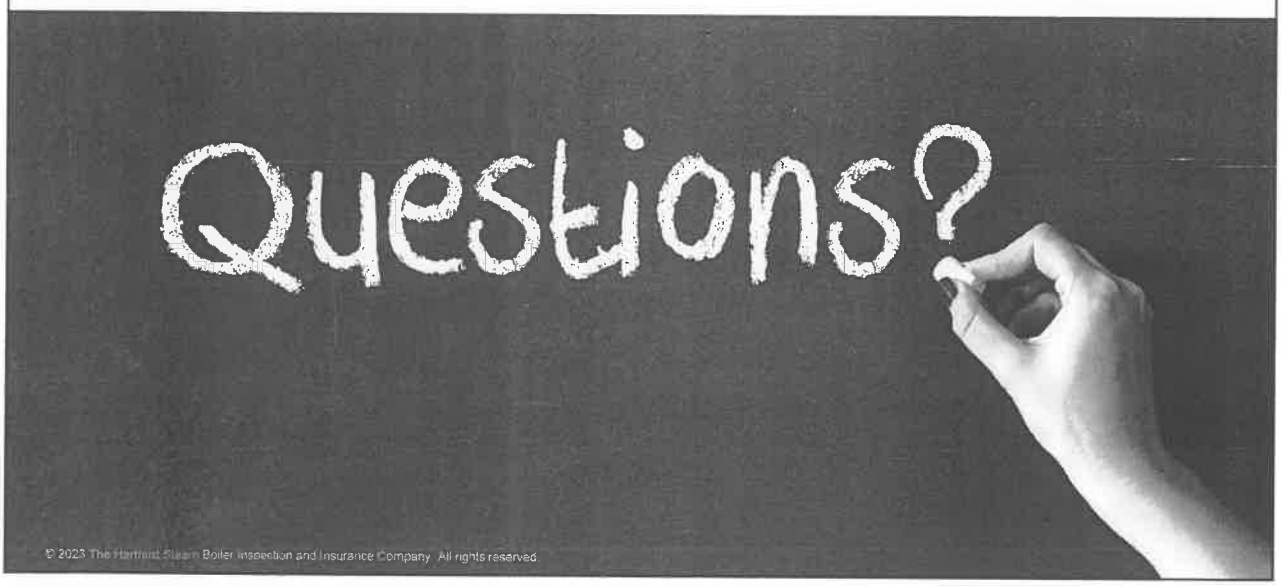

338

REVIEW

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Major Revisions

- Section I
- Section II

Code Cases

- Section V

Interpretations

- Section VIII
- Section IX

339

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Thank you

341