HYDROTEST PRESSURE CALCULATION

➢ Refer ASME SEC VIII DIV 1 in *UG 99 (b)* is applicable for hydrotest pressure test calculation.

TEST PRESSURE CALCULATION

1.3 * MAWP * LSR

MAWP

The maximum allowable working pressure may be assumed to be the *same as the design pressure* when calculations are not made to determine the maximum allowable working pressure.

LSR

lowest stress ratio (LSR) for the pressure boundary materials of which the vessel is constructed.The stress ratio for each pressure boundary material is the ratio of the *stress value S at its test temperature* to the *stress value S at its design temperature*

LSR = Stress value S at its test temperature / Stress value S at its design temperature.

➤ stress value S at its design temperature is refer to ASME SEC II PART D

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, mm	P-No.	Group No.
1	Carbon steel	Castings	SA–352	LCB	J03003	...	...	1	1
2	Carbon steel	Plate	SA–515	65	K02800	...	...	1	1
3	Carbon steel	Plate	SA–516	65	K02403	...	...	1	1
4	Carbon steel	Wld. pipe	SA–671	CB65	K02800	...	...	1	1
5	Carbon steel	Wld. pipe	SA–671	CC65	K02403	...	...	1	1
6	Carbon steel	Wld. pipe	SA–672	B65	K02800	...	...	1	1
7	Carbon steel	Wld. pipe	SA–672	C65	K02403	...	...	1	1
8	Carbon steel	Sheet	SA–414	E	K02704	...	...	1	1
9	Carbon steel	Plate	SA–662	B	K02203	...	...	1	1
10	Carbon steel	Plate	SA–537	...	K12437	1	$65 < t \le 100$	1	2
11	Carbon steel	Wld. pipe	SA–691	CMSH–70	K12437	...	$65 < t \le 100$	1	2
12	Carbon steel	Plate, bar	SA/CSA–G40.21	44W	...	...	$t \le 200$	1	1
13	Carbon steel	Plate, bar	SA/CSA–G40.21	50W	...	...	$t \le 150$	1	1
14	Carbon steel	Plate, sheet, bar	SA–572	50	...	...	$t \le 100$	...	...
15	Carbon steel	Round bar	SA–572	50	...	...	$t \le 275$	...	...
16	Carbon steel	Sheet, strip	SA–1011	50	SS	...	$t \le 6$	...	...
17	Carbon steel	Sheet, strip	SA–1011	50	HSLAS	1	...	...	...
18	Carbon steel	Sheet, strip	SA–1011	55	HSLAS	2	...	...	...
19	Carbon steel	Plate	SA/AS 1548	PT460N	...	Normalized	≤ 150	1	1
20	Carbon steel	Plate	SA/AS 1548	PT460NR	...	Norm. rld.	≤ 150	1	1
21	Carbon steel	Forgings	SA/EN 10222–2	P280GH	...	NT or QT	$35 < t \le 160$	1	1
22	Carbon steel	Plate	SA/EN 10028–2	P295GH	...	...	$60 < t \le 100$	1	1
23	Carbon steel	Plate	SA/EN 10028–2	P295GH	...	...	≤ 60	1	1
24	Carbon steel	Forgings	SA/EN 10222–2	P280GH	...	Normalized	$t \le 35$	1	1
25	Carbon steel	Plate	SA/GB 713	Q345R	...	...	$150 < t \le 250$	1	2
26	Carbon steel	Plate	SA/EN 10028–2	P355GH	...	...	$150 < t \le 250$	1	2
27	Carbon steel	Plate	SA/GB 713	Q345R	...	...	$100 < t \le 150$	1	2
28	Carbon steel	Plate	SA/EN 10028–2	P355GH	...	...	$100 < t \le 150$	1	2
29	Carbon steel	Plate	SA–455	...	K03300	...	$15 < t \le 20$	1	2
30	Carbon steel	Bar	SA–675	70	...	...	...	1	2

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, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475
1	128	128	128	128	128	128	128	125	122	118	114	...	...	...	...
2	128	128	128	128	128	128	128	125	122	118	114	95.0	79.6	63.2	45.3
3	128	128	128	128	128	128	128	125	122	118	114	95.0	79.6	63.2	45.3
4	128	128	128	128	128	128	128	125	122	118	114	...	...	...	...
5	128	128	128	128	128	128	128	125	122	118	114	...	...	...	...
6	128	128	128	128	128	128	128	125	122	118	114	...	...	...	...
7	128	128	128	128	128	128	128	125	122	118	114	...	...	...	...
8	128	128	128	128	128	128	128	128	127	114	95.1	79.6	63.1	45.7	
9	128	128	128	128	128	128	128	128	128	127	114	...	...	...	...
10	128	128	128	128	128	128	128	128	128	127	114	...	...	...	...
11	128	128	128	128	128	128	128	128	128	127	114	...	...	...	...
12	128	128	128	128	128	128	128	128	128	128	...	...	...	...	...
13	128	128	128	128	128	128	128	128	128	128	...	...	...	...	...
14	128	128	128	128	128	128	128	128	128	127	...	...	...	...	...
15	128	128	128	128	128	128	128	128	128	127	...	...	...	...	...
16	128	128	128	128	128	128	128	128	128	127	...	...	...	...	...
17	128	128	128	128	128	128	128	128	128	127	...	...	...	...	...
18	128	128	128	128	128	128	128	128	128	127	...	...	...	...	...
19	131	131	131	131	131	131	131	131	131	129	114	95.1	79.6	63.2	45.3
20	131	131	131	131	131	131	131	131	131	129	114	95.1	79.6	63.2	45.3
21	131	131	131	131	131	131	131	131	128	124	120	101	83.9	67.0	51.1
22	131	131	131	131	131	131	131	131	131	127	112	96.2	79.1	62.1	46.0
23	131	131	131	131	131	131	131	131	131	127	112	96.2	79.1	62.1	46.0
24	131	131	131	131	131	131	131	131	131	131	131	101	83.9	67.0	51.1
25	134	134	134	134	134	134	134	134	134	130	123	101	83.8	67.1	...
26	134	134	134	134	134	134	134	134	134	134	123	101	83.8	67.1	51.0
27	137	137	137	137	137	137	137	137	137	137	123	101	83.8	67.1	...
28	137	137	137	137	137	137	137	137	137	137	123	101	83.8	67.1	51.0
29	138	138	138	138	138	137	132	126	122	119	...	...	...	...	...
30	138	138	138	138	138	137	132	126	122	119	114	101	83.9	67.0	51.1

For Example

1. 1.3 is constant value

2. MAWP - Same as the design pressure assume 20 bar(g)

3. Stress value S at its test temperature

4. Stress value S at its design temperature

LSR = Stress value S at its test temperature

Stress value S at its design temperature.

$$= \frac{138}{138}$$

LSR = 1

Formula

= 1.3*MAWP*LSR

= 1.3*20*1

Ans = 26 kg/cm^2

PRESSURE GAUGE SELECTION

➢ Refer ASME SEC VIII DIV 1 in *UG 102* is applicable for test gages.

➢ An indicating gage shall be connected directly to the vessel or with a pressure line that does not include intermediate

➢ valves.*But the range must be at least 1.5 times and not more than 4 times the test pressure.*