

# SA-515

## Carbon Steel Pressure Vessel Plates for Intermediate & Higher Temperatures

**TABLE 1 CHEMICAL REQUIREMENTS**

Elements	Composition, %			
	Grade 55 (Grade 380)	Grade 60 (Grade 415)	Grade 65 (Grade 450)	Grade 70 (Grade 485)
Carbon, max <sup>A</sup> :				
1 in. (25 mm) and under	0.20	0.24	0.28	0.31
Over 1 to 2 in. (25 to 50 mm), incl	0.22	0.27	0.31	0.33
Over 2 to 4 in. (50 to 100 mm), incl	0.24	0.29	0.33	0.35
Over 4 to 8 in. (100 to 200 mm), incl	0.26	0.31	0.33	0.35
Over 8 in. (200 mm)	0.28	0.31	0.33	0.35
Manganese, max:				
Heat analysis	0.90	0.90	0.90	1.20
Product analysis	0.98	0.98	0.98	1.30
Phosphorus, max <sup>A</sup>	0.035	0.035	0.035	0.035
Sulfur, max <sup>A</sup>	0.04	0.04	0.04	0.04
Silicon:				
Heat analysis	0.15-0.40	0.15-0.40	0.15-0.40	0.15-0.40
Product analysis	0.13-0.45	0.13-0.45	0.13-0.45	0.13-0.45

<sup>A</sup> Applies to both heat and product analysis

**TABLE 2 TENSILE REQUIREMENTS**

	Grade			
	55(380)	60(415)	65(450)	70(485)
Tensile strength, ksi (MPa)	55-75(380-515)	60-80(415-550)	65-85(450-585)	70-90(485-620)
Yield strength, min. ksi (MPa)	30(205)	32(220)	35(240)	38(260)
Elongation in 8 in. (200 mm), min. %	23 <sup>A</sup>	21 <sup>A</sup>	19 <sup>A</sup>	17 <sup>A</sup>
Elongation in 2 in. (50 mm), min. %	27 <sup>A</sup>	25 <sup>A</sup>	23 <sup>A</sup>	21 <sup>A</sup>

<sup>A</sup> See Specification A 20/A 20M.

# SA-537

## Heat Treated Carbon - Manganese - Silicon Steel Pressure Vessel Plates

**TABLE 1 CHEMICAL REQUIREMENTS**

Element	Composition, %
Carbon, max <sup>A</sup>	0.24
Manganese:	
1 in. (40 mm) and under in thickness: <sup>B</sup>	
Heat analysis	0.70-1.35
Product analysis	0.64-1.46
Over 1 in. (40 mm) in thickness:	
Heat analysis	1.00-1.60
Product analysis	0.92-1.72
Phosphorus, max <sup>A</sup>	0.035
Sulfur, max <sup>A</sup>	0.040
Silicon:	
Heat analysis	0.15-0.50
Product analysis	0.13-0.55
Copper, max:	
Heat analysis	0.35
Product analysis	0.38
Nickel, max:	
Heat analysis	0.25
Product analysis	0.28
Chromium, max:	
Heat analysis	0.25
Product analysis	0.29
Molybdenum, max:	
Heat analysis	0.08
Product analysis	0.09

**TABLE 2 TENSILE REQUIREMENTS**

	Class 1	Class 2
	ksi(MPa)	ksi(MPa)
Tensile strength:		
2-1/2 in. and under (65mm and under)	70-90 (485-620)	80-100 (550-690)
Over 2-1/2 to 4 in., incl (Over 65 to 100 mm, incl)	65-85 (450-585)	75-95 (515-655)
Over 4 to 6 in., incl (Over 100 to 150 mm, incl)	...	70-90 (485-620)
Yield strength, min:		
2 1/2 in. and under (65 mm and under)	50 (345)	60 (415)
Over 2-1/2 to 4 in., incl (Over 65 to 100 mm, incl)	45 (310)	55 (380)
Over 4 to 6 in., incl (Over 100 to 150 mm, incl)	...	46 (315)
Elongation in 2 in. (50 mm), min. %:		
4 in. (100 mm) and under	22	22
Over 4 in. (100 mm)	...	20
Elongation in 8 in. (200 mm), min. %	18 <sup>A</sup>	...

<sup>A</sup> See Specification A 20/A 20M.

<sup>A</sup> Applies to both heat and product analysis

<sup>B</sup> Manganese may exceed 1.35 on heat analysis up to a maximum of 1.60, provided that the heat analysis carbon equivalent does not exceed 0.57%