

## API 5L Grade B

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### Production Standard of API 5L Grade B

#### •API 5L Grade B

API 5L Grade B is a pipeline steel pipe specification set by the American Petroleum Institute (API), widely used in transporting oil, natural gas, and water through pipeline systems. This material offers good mechanical properties and sufficient tensile strength, ensuring stable operation under various environmental conditions. API 5L Grade B pipes come in two product specification levels: PSL1 and PSL2, with PSL2 having more stringent chemical and mechanical requirements than PSL1, making it suitable for more complex or demanding applications.

#### •Dimensions and Sizes of API 5L Grade B

NPS		O. D.	W. T.														
D	Inc	mm	SCH 5S	SCH 10S	SCH 10	SCH 20	SCH 30	SCH 40	SCH 60	SCH 80	SCH 100	SCH 120	SCH 140	SCH 160	Sth	XS	XXS
50	2"	60.	1.65	2.77	–	–	–	3.91	–	5.54	–	–	–	8.74	3.9	5.5	11.07

		3													1	4	
65	2 1/2 "	73	2.11	3.05	-	-	-	5.16	-	7.01	-	-	-	9.53	5.1 6	7.0 1	14.02
80	3"	88. 9	2.11	3.05	-	-	-	5.49	-	7.62	-	-	-	11.13	5.4 9	7.5 2	15.24
90	3 1/2 "	101 .6	2.11	3.05	-	-	-	5.74	-	8.08	-	-	-	-	5.7 4	8.0 8	-
100	4"	114 .3	2.11	3.05	-	-	-	6.02	-	8.58	-	11.13	-	13.49	6.0 2	8.5 6	17.12
125	5"	141 .3	2.77	3.4	-	-	-	6.55	-	9.53	-	12.7	-	15.88	6.5 5	9.5 3	18.05
150	6"	168 .3	2.77	3.4	-	-	-	7.11	-	10.9 7	-	14.27	-	18.26	7.1 1	10. 97	21.95
200	8"	219 .1	2.77	3.76	-	6.35	7.04	8.18	10.3 1	12.7	15.09	18.26	20.62	23.01	8.1 8	12. 7	22.23
250	10 "	273 .1	3.4	4.19	-	6.35	7.8	9.27	12.7	15.0 9	18.26	21.44	25.4	28.58	9.2 7	12. 7	25.4
300	12 "	323 .9	3.96	4.57	-	6.35	8.38	10.3 1	14.2 7	17.4 8	21.44	25.4	28.58	33.32	9.5 3	12. 7	25.4
350	14 "	355 .5	3.96	4.78	6.35	7.92	9.53	11.1 3	15.0 9	19.0 5	23.83	27.79	31.75	35.71	9.5 3	12. 7	-
400	16 "	406 .4	4.19	4.78	6.35	7.92	9.53	12.7	16.6 6	21.4 4	26.19	30.96	36.53	40.49	9.5 3	12. 7	-
450	18 "	457 .2	4.19	4.78	6.35	7.92	11.1 3	14.2 7	19.0 5	23.8 3	39.36	34.93	39.67	45.24	-	-	-
500	20 "	508	4.78	5.54	6.35	9.53	12.7	15.0 9	20.6 2	26.1 9	32.54	38.1	44.45	50.01	-	-	-
550	22 "	558 .8	4.78	5.54	6.35	9.53	12.7	-	22.2 3	28.5 8	34.93	41.28	47.63	53.98	-	-	-
600	24 "	609 .6	5.54	6.35	6.35	9.53	14.2 7	17.4 8	24.6 1	30.9 6	38.89	46.02	52.37	59.54	-	-	-

## ●Chemical Composition of API 5L Grade B

- Chemical Composition for API 5L Grade B PSL 1 pipe with  $t \leq 0.984$ "

Steel Grade	Mass fraction, % based on heat and product analyses a,g						
	C	Mn	P	S	V	Nb	Ti
	max b	max b	max	max	max	max	max
<b>Welded Pipe</b>							
B	0.26	1.2	0.03	0.03	c,d	c,d	d
V + Nb: $\leq 0.06$ , Unless otherwise agreed.							
V + Nb + Ti: $\leq 0.15$							
For each 0.01% reduction of C; Mn content can be increased by 0.05% to a maximum of 1.65%							
a. $Cu \leq 0.50\%$ ; $Ni \leq 0.50\%$ ; $Cr \leq 0.50\%$ ; and $Mo \leq 0.15\%$ , b. For each reduction of 0.01% below the specified maximum concentration for carbon, an increase of 0.05% above the specified maximum concentration for Mn is permissible, up to a maximum of 1.65% for grades $\geq L245$ or B, but $\leq L360$ or X52; up to a maximum of 1.75% for grades $> L360$ or X52, but $< L485$ or X70; and up to a maximum of 2.00% for grade L485 or X70., c. Unless otherwise agreed $Nb + V \leq 0.06\%$ , d. $Nb + V + Ti \leq 0.15\%$ , e. Unless otherwise agreed., f. Unless otherwise agreed, $Nb + V + Ti \leq 0.15\%$ , g. No deliberate addition of B is permitted and the residual B $\leq 0.001\%$							

- Chemical Composition for API 5L Grade B PSL 2 Pipe with  $t \leq 0.984$ "

Steel Grade	Mass fraction, % based on heat and product analyses									Carbon Equivalent	
	C	Si	Mn	P	S	V	Nb	Ti	Other	CE IIW	CE Pcm
	max b	max	max b	max	max	max	max	max		max	max
<b>Welded Pipe</b>											
Grade BM	0.22	0.45	1.2	0.025	0.015	0.05	0.05	0.04	e,l	0.043	0.25

- a. SMLS  $t > 0.787"$ , CE limits shall be as agreed. The CEIIW limits applied if  $C > 0.12\%$  and the CEPcm limits apply if  $C \leq 0.12\%$ ,
- b. For each reduction of 0.01% below the specified maximum for C, an increase of 0.05% above the specified maximum for Mn is permissible, up to a maximum of 1.65% for grades  $\geq$  L245 or B, but  $\leq$  L360 or X52; up to a maximum of 1.75% for grades  $>$  L360 or X52, but  $<$  L485 or X70; up to a maximum of 2.00% for grades  $\geq$  L485 or X70, but  $\leq$  L555 or X80; and up to a maximum of 2.20% for grades  $>$  L555 or X80.,
- c. Unless otherwise agreed  $Nb = V \leq 0.06\%$ ,
- d.  $Nb = V = Ti \leq 0.15\%$ ,
- e. Unless otherwise agreed,  $Cu \leq 0.50\%$ ;  $Ni \leq 0.30\%$   $Cr \leq 0.30\%$  and  $Mo \leq 0.15\%$ ,
- f. Unless otherwise agreed,
- g. Unless otherwise agreed,  $Nb + V + Ti \leq 0.15\%$ ,
- h. Unless otherwise agreed,  $Cu \leq 0.50\%$   $Ni \leq 0.50\%$   $Cr \leq 0.50\%$  and  $MO \leq 0.50\%$ ,
- i. Unless otherwise agreed,  $Cu \leq 0.50\%$   $Ni \leq 1.00\%$   $Cr \leq 0.50\%$  and  $MO \leq 0.50\%$ ,
- j.  $B \leq 0.004\%$ ,
- k. Unless otherwise agreed,  $Cu \leq 0.50\%$   $Ni \leq 1.00\%$   $Cr \leq 0.55\%$  and  $MO \leq 0.80\%$ ,
- l. For all PSL 2 pipe grades except those grades with footnotes j noted, the following applies. Unless otherwise agreed no intentional addition of B is permitted and residual  $B \leq 0.001\%$ .

## ●Mechanical Properties Tensile Strength of API 5L Grade B

### - Mechanical Properties for API 5L Grade B PSL-1 & PSL-2 Pipe

Pipe Grade	Tensile Properties – Pipe Body of SMLS and Welded Pipes PSL 2					Seam of Welded Pipe	
	Yield Strength a		Tensile Strength a		Ratio a, c	Elongation	Tensile Strength d
	Rt0,5 PSI Min		Rm PSI Min		R10,5IRm	(in 2in)	Rm (psi)
	Minimum	Maximum	Minimum	Maximum	Maximum	Af %	Minimum
BR, BN, BQ, BM	35,500	65,300	60,200	95,000	0.93	f	60,200

a. For intermediate grade, the difference between the specified minimum tensile strength and the specified minimum yield for the pipe body shall be as given for the next higher grade.

b. For the intermediate grades, the specified minimum tensile strength for the weld seam shall be the same as determined for the body using footnote a.

c. The specified minimum elongation,  $A_f$ , expressed in percent and rounded to the nearest percent, shall be determined using the following equation:

equation-formula

Where C is 1 940 for calculation using SI units and 625 000 for calculation using USC units

$A_{xc}$  is the applicable tensile test piece cross-sectional area, expressed in square millimeters (square inches), as follows

– For circular cross-section test pieces, 130mm<sup>2</sup> (0.20 in<sup>2</sup>) for 12.7 mm (0.500 in) and 8.9 mm (.350 in) diameter test pieces; and 65 mm<sup>2</sup> (0.10 in<sup>2</sup>) for 6.4 mm (0.250in) diameter test pieces.

– For full-section test pieces, the lesser of a) 485 mm<sup>2</sup> (0.75 in<sup>2</sup>) and b) the cross-sectional area of the test piece, derived using the specified outside diameter and the specified wall thickness of the pipe, rounded to the nearest 10 mm<sup>2</sup> (0.10in<sup>2</sup>)

– For strip test pieces, the lesser of a) 485 mm<sup>2</sup> (0.75 in<sup>2</sup>) and b) the cross-sectional area of the test piece, derived using the specified width of the test piece and the specified wall thickness of the pipe, rounded to the nearest 10 mm<sup>2</sup> (0.10in<sup>2</sup>)

U is the specified minimum tensile strength, expressed in megapascals (pounds per square inch)