

API 5L X46

- Production Standard of API 5L X46
- Dimensions and Sizes of API 5L X46
- Chemical Composition of API 5L X46
- Mechanical Properties Tensile Strength and Yield Strength of API 5L X46



Production Standard of API 5L X46

● API 5L X46

API 5L X46 Pipe is a carbon steel pipe that is meticulously constructed under API (AMERICAN PETROLEUM INSTITUTE) specifications to satisfy the needs of the client. X46 is a steel grade in the API 5L standard for steel pipes used in the petroleum and natural gas industries.

● Dimensions and Sizes of API 5L X46

NPS		O. D. mm	W. T.														
D N	Inc h		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"	60.3	1.65	2.77	–	–	–	3.91	–	5.54	–	–	–	8.74	3.91	5.54	11.07
65	2 1/2"	73	2.11	3.05	–	–	–	5.16	–	7.01	–	–	–	9.53	5.16	7.01	14.02

80	3"	88.9	2.11	3.05	-	-	-	5.49	-	7.62	-	-	-	11.13	5.49	7.52	15.24
90	3 1/2"	101.6	2.11	3.05	-	-	-	5.74	-	8.08	-	-	-	-	5.74	8.08	-
100	4"	114.3	2.11	3.05	-	-	-	6.02	-	8.58	-	11.13	-	13.49	6.02	8.56	17.12
125	5"	141.3	2.77	3.4	-	-	-	6.55	-	9.53	-	12.7	-	15.88	6.55	9.53	18.05
150	6"	168.3	2.77	3.4	-	-	-	7.11	-	10.97	-	14.27	-	18.26	7.11	10.97	21.95
200	8"	219.1	2.77	3.76	-	6.35	7.04	8.18	10.31	12.7	15.09	18.26	20.62	23.01	8.18	12.7	22.23
250	10"	273.1	3.4	4.19	-	6.35	7.8	9.27	12.7	15.09	18.26	21.44	25.4	28.58	9.27	12.7	25.4
300	12"	323.9	3.96	4.57	-	6.35	8.38	10.31	14.27	17.48	21.44	25.4	28.58	33.32	9.53	12.7	25.4
350	14"	355.5	3.96	4.78	6.35	7.92	9.53	11.13	15.09	19.05	23.83	27.79	31.75	35.71	9.53	12.7	-
400	16"	406.4	4.19	4.78	6.35	7.92	9.53	12.7	16.66	21.44	26.19	30.96	36.53	40.49	9.53	12.7	-
450	18"	457.2	4.19	4.78	6.35	7.92	11.13	14.27	19.05	23.83	39.36	34.93	39.67	45.24	-	-	-
500	20"	508	4.78	5.54	6.35	9.53	12.7	15.09	20.62	26.19	32.54	38.1	44.45	50.01	-	-	-
550	22"	558.8	4.78	5.54	6.35	9.53	12.7	-	22.23	28.58	34.93	41.28	47.63	53.98	-	-	-
600	24"	609.6	5.54	6.35	6.35	9.53	14.27	17.48	24.61	30.96	38.89	46.02	52.37	59.54	-	-	-

●Chemical Composition of API 5L X46

- Chemical Composition for API 5L X46 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
Welded Pipe							
X46	0.26	1.4	0.3	0.3	d	d	d
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 X46 PSL 2 Pipe with $t \leq 0.984$ "

Steel Grade	Mass fraction, % based on heat and product analyses									Carbon Equiv a	
	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
Welded Pipe											
X46M	0.22	0.45	1.3	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 X46

- Mechanical Properties for API 5L X46 PSL-1 Pipe

Pipe Grade	Tensile Properties – Pipe Body of SMLS and Welded Pipes PSL 1			Seam of Welded Pipe
	Yield Strength a	Tensile Strength a	Elongation	Tensile Strength b
	Rt _{0.5} PSI Min	Rm PSI Min	(in 2in Af % min)	Rm PSI Min
X46	46,400	63,100	c	63,100

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, Af, expressed in percent and rounded to the nearest percent, shall be determined using the following equation:

$$Af = C \frac{A_{xc}^{0,2}}{U^{0,9}}$$

Where C is 1940 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, 130mm² (0.20 in²) for 12.7 mm (0.500 in) and 8.9 mm (.350 in) diameter test pieces; and 65 mm² (0.10 in²) for 6.4 mm (0.250in) diameter test pieces.

– For full-section test pieces, the lesser of a) 485 mm² (0.75 in²) 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 mm² (0.10in²)

– For strip test pieces, the lesser of a) 485 mm² (0.75 in²) 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 mm² (0.10in²)

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

- Mechanical Properties for API 5L X46 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
	R _{t0,5} PSI Min		R _m PSI Min		R _{10,5} R _m	(in 2in)	R _m (psi)
	Minimum	Maximum	Minimum	Maximum	Maximum	A _f %	Minimum
X46N, X46Q, X46M	46,400	76,100	63,100	95,000	0.93	f	63,100

a. For intermediate grade, refer to the full API5L specification.

b. for grades > X90 refers to the full API5L specification.

c. This limit applies for pipes with D> 12.750 in

d. For intermediate grades, the specified minimum tensile strength for the weld seam shall be the same value as was determined for the pipe body using foot a.

e. for pipe requiring longitudinal testing, the maximum yield strength shall be ≤ 71,800 psi

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

$$Af = C \frac{A_{xc}^{0.2}}{U_{0.9}}$$

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, 130mm² (0.20 in²) for 12.7 mm (0.500 in) and 8.9 mm (.350 in) diameter test pieces; and 65 mm² (0.10 in²) for 6.4 mm (0.250in) diameter test pieces.

– For full-section test pieces, the lesser of a) 485 mm² (0.75 in²) 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 mm² (0.10in²)

– For strip test pieces, the lesser of a) 485 mm² (0.75 in²) 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 mm² (0.10in²)

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

g. Lower values fo R10,5IRm may be specified by agreement

h. for grades > x90 refers to the full API5L specification.