

3. Hot-rolled steel flats

3.4. HOT-ROLLED STEEL FOR MANUFACTURING OF PIPES ACCORDING TO STANDARD API 5L

Table 3.30. Chemical composition of steel and mechanical properties of steel

Grade under API 5L	Fraction of total mass, % (NLMK)							Mechanical properties under API 5L			
	C	Mn	Si	Al	S	P	N	Yield point min, MPa	Tensile strength min, MPa	Elongation, % min	
	max				max					(min. thickness)	(max. thickness)
A	0.10	0.60	0.30	0.02–0.06	0.015	0.020	0.009	207	331	23.5 (1.5 mm)	36.0 (14 mm)
B	0.12	1.15	0.30	0.02–0.06	0.015	0.020	0.009	241	413	19.5 (1.8 mm)	29.5 (14 mm)
X42	0.12	1.15	0.30	0.02–0.06	0.015	0.020	0.009	289	413	19.5 (1.8 mm)	29.5 (14 mm)
X46	0.12	1.25	0.30	0.02–0.06	0.015	0.020	0.009	317	434	19.5 (2.0 mm)	28.5 (14 mm)
X52	0.12	1.25	0.30	0.02–0.06	0.015	0.020	0.009	358	455	20.0 (3.0 mm)	27.0 (14 mm)
X56	0.12	1.35	0.30	0.02–0.06	0.015	0.020	0.009	386	489	19.0 (3.0 mm)	25.5 (14 mm)
X60	0.14	1.50	0.30	0.02–0.06	0.015	0.020	0.009	413	517	18.5 (3.5 mm)	24.0 (14 mm)
X65	0.14	1.50	0.30	0.02–0.06	0.015	0.020	0.009	448	530	18.5 (3.5 mm)	23.5 (14 mm)
X70	0.14	1.70	0.30	0.02–0.06	0.015	0.020	0.009	483	565	17 (3.5 mm)	22 (14 mm)

Carbon equivalent CE (IIW) and cracking factor CE (Pcm) are calculated by the following formulas:

$$CE (IIW) = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Ni + Cu}{15};$$

$$CE (Pcm) = C + \frac{Si}{30} + \frac{Mn}{20} + \frac{Cu}{20} + \frac{Ni}{60} + \frac{Cr}{20} + \frac{Mo}{15} + \frac{V}{10} + 5B.$$

Total V + Nb + Ti shall not exceed 0.10% for grades X52, X56, and 0.15% for grades Kh60, Kh65, X70. On customer demand ultra low content of sulfur (not more than 0.010%; 0.005%), phosphorous (not more than 0.015%), non-ferrous impurities (Cr + Ni + Cu + Mo not more than 0.15%) is provided as well as steel modification with Ca.

Thickness-to-width relation

Figure 3.21. Steel grade A

Strip thickness, mm	Strip width, mm							
	900	1280	1360	1440	1550	1640	1710	1850
1.5								
1.8								
2.0								
2.6								
3.0								
3.5								
up to 14.0								

Hot-rolled material with other product mix requirements, including those in terms of thickness to width ratio may be produced on special order subject to an additional agreement.

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Figure 3.22. Steel grades B, X42

Strip thickness, mm	Strip width, mm							
	900	1280	1360	1440	1550	1640	1710	1850
1.8								
1.9								
2.0								
3.0								
4.0								
up to 14.0								

Hot-rolled material with other product mix requirements, including those in terms of thickness to width ratio may be produced on special order subject to an additional agreement.

Figure 3.23. Steel grade X46

Strip thickness, mm	Strip width, mm							
	900	1280	1360	1440	1550	1640	1710	1850
2.0								
3.5								
4.0								
5.0								
up to 14.0								

Hot-rolled material with other product mix requirements, including those in terms of thickness to width ratio may be produced on special order subject to an additional agreement.

Figure 3.24. Steel grades X52, X56

Strip thickness, mm	Strip width, mm							
	900	1280	1360	1440	1550	1640	1710	1850
3.0								
4.0								
6.0								
7.0								
up to 14.0								

Hot-rolled material with other product mix requirements, including those in terms of thickness to width ratio may be produced on special order subject to an additional agreement.

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Figure 3.25. Steel grades X60, X65, X70

Strip thickness, mm	Strip width, mm							
	914	1280	1360	1440	1550	1640	1710	1850
3.5								
4.5								
6.5								
7.5								
up to 14.0								

Rolled steel with other dimensional requirements, including those to thickness-to-width relation, may be produced to special order upon additional agreement.