Steel Sheet Pile

Steel Grades

Standard Designation: NF 35.520 (FRANCE) Circulaire 590.2 (BELGIUM)					Other steel grades comparable properties been supplied in compliance with the specifications and recommandations of the following standards					
Grade	Minimum yield point N/mm2	Minimum tensile strength N/mm2	Minimum elongation Lo-5.65 So %	Bend test 180° e < 16mm/ e > 16mm	Euronorm 25 - 72	USA ASTM	Canada CSA G. 4021	G.B. BS 4360	G.F.R. EAU	Japan A. 5528
E 240 SP	240	390	28	1e 1.5e	Fe 360 B				SiSo 37	
PAE 250	250	390	26	1e						
PAE 270	270	420	25	1.5e	Fe 430 B	A 328	Gr.260 W	Gr.43 A	SiSo 45	
E 270 SP	270	440	25	1e 1.5e						
PAE 300	300	450	23	2e	Fe 490 B	A 572 Gr.42	Gr.300 W			SY 295
PAE 320	320	470	23	2e		A 572 Gr.45				
E 320 SP	320	490	23	1.5e 2e						
PAE 360 2)	360	490	22	2.5e	Fe 510 B	A 572 Gr.50	Gr.350 W	Gr.50 A	SiSo S	
E 360 SP	360	510	22	2e 3e						
PAE 390 2)	390	510	20	2.5e		A 572 Gr.55				SY 390
E 390 SP*	390	550	20	2e 3e						
PAE 420 2)	420	520	19	3e		A 572 Gr.60	Gr.400 W			
E 430 SP*	430	570	17	3e 4e						
MERCOR 360	360	490	22	2.5e	A 690					

* These grades may contain dispersoid elements within the following ranges.
Mo - 0.01-0.06%, V - 0.02-0.10%

1) If all other conditions are respected a tensile strength of 20 N/mm² lower than the minimum indicated is acceptable.
Addition of copper: on request

2) For qualities with a guaranteed minimum yield point equal or higher than 360 N/mm² the carbon content in the heat analysis is limited to 0.22% and the manganese content to 1.6%.

Steel Qualities

	Ultimate Stress		Minimum Yield Stress				Minimum Elongation on 200mm	
			Up to and including 16mm thick		Over 16mm up to and including 40mm thick		Up to and including 9mm thick	Over 9mm thick
	kg/mm²	N/mm²	kg/mm²	N/mm²	kg/mm²	N/mm²	%	%
BS.4360: 1986 (Mild Steel) Grade 43A	43.8/59.1	430/580	28.0	275	27.0	265	16	20
BS.4360: 1986 (High yield Steel) Grade 50A	49.9/65.2	490/640	36.2	355	35.2	345	15	18
Similar to ASTM - A328	48.2 min.	482.6 min.	27.0	265	27.0	265	-	17

Notes:
COPPER BEARING STEEL - all the grades of steel are available with 0.20% up to 0.35% or over 0.35% up to 0.50% Copper content.
1 N/mm² = 0.101972 kg/mm²

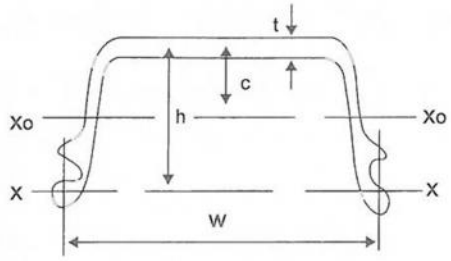
Recommended working stresses for Steel Sheet Piling

Class of Work	BS.4360: 1986 Grade 43A ASTM A328 (Mild Steel)		BS. 4360: 1986 Grade 50A (High yield Steel)	
	kg/mm²	N/mm²	kg/mm²	N/mm²
Permanent	14.2	140	18.3	180

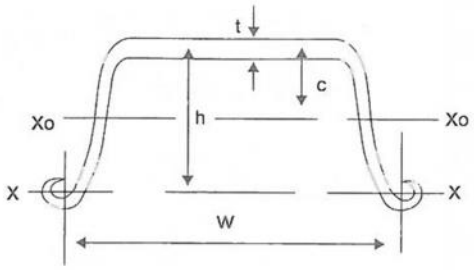
Notes:
For guidance only.
Stresses in temporary conditions occurring during construction may be varied at the discretion of the client's engineer.

Steel Sheet Piles - U Type

YSP



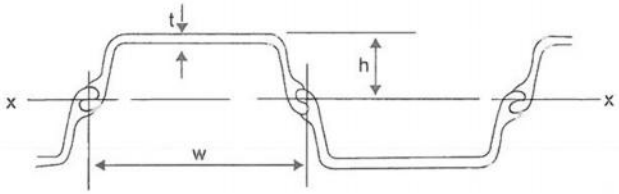
FSP



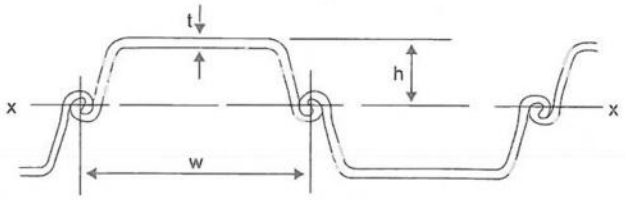
Designation	Dimensions						Sectional Area				Surface Area			
	W		h		t		per pile		per wall width		per pile		per wall width	
	mm	in	mm	in	mm	in	cm^2	in^2	cm^2/ m	in^2/ft	m^2/m	ft^2/ft	m^2/m^2	ft^2/t^2
YSP I	400	15.7	75	2.95	8.0	0.315	46.49	7.206	116.2	4.589	1.15	3.77	1.44	1.44
YSP U-5	400	15.7	80	3.15	7.6	0.299	45.21	7.008	113.0	5.338	1.17	3.84	1.47	1.47
FSP IA	400	15.7	85	3.35	8.0	0.315	45.21	7.008	113.0	5.338	1.21	3.97	1.51	1.51
YSP II	400	15.7	100	3.94	10.5	0.413	61.18	9.483	153.0	7.228	1.24	4.07	1.55	1.55
FSP II	400	15.7	100	3.94	10.5	0.413	61.18	9.483	153.0	7.228	1.33	4.36	1.66	1.66
YSP U-9	400	15.7	110	4.33	9.3	0.366	55.01	8.527	137.5	6.496	1.29	4.23	1.61	1.61
FSP IIA	400	15.7	120	4.72	9.2	0.362	55.01	8.527	137.5	6.496	1.34	4.40	1.68	1.68
YSP III	400	15.7	125	4.92	13.0	0.512	76.42	11.85	191.0	9.022	1.33	4.36	1.66	1.66
FSP III	400	15.7	125	4.92	13.0	0.512	76.42	11.85	191.0	9.022	1.44	4.72	1.80	1.80
YSP U-15	400	15.7	150	5.91	12.2	0.480	74.40	11.53	186.0	8.788	1.43	4.69	1.78	1.78
FSP IIIA	400	15.7	150	5.91	13.1	0.516	74.40	11.53	186.0	8.788	1.44	4.72	1.80	1.80
YSP IV	400	15.7	155	6.10	15.5	0.610	96.99	15.03	242.5	11.46	1.47	4.82	1.84	1.84
FSP IV	400	15.7	170	6.69	15.5	0.610	96.99	15.03	242.5	11.46	1.61	5.28	2.01	2.01
YSP U-23	400	15.7	175	6.89	14.7	0.579	94.21	14.60	235.5	11.12	1.56	5.12	1.94	1.94
FSP IVA	400	15.7	185	7.28	16.1	0.634	94.21	14.60	235.1	11.11	1.57	5.15	1.96	1.96
YSP V	420	16.5	175	6.89	22.0	0.866	134.0	20.77	319.0	15.07	1.59	5.22	1.99	1.99
FSP VL	500	19.7	200	7.87	24.3	0.957	133.8	20.74	267.6	12.64	1.75	5.74	1.75	1.75
FSP VIL	500	19.7	225	8.86	27.6	1.09	153.0	23.72	306.0	14.46	1.83	6.00	1.83	1.83

Steel Sheet Piles - U Type

YSP



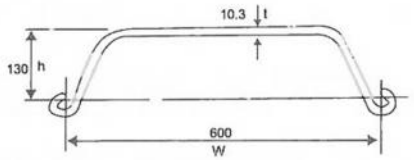
FSP



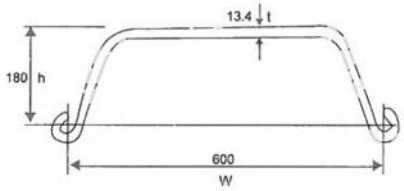
Centre		weight				Moment of Inertia				Radius of Gyration		Section Modulus			
C		per pile		per wall width		per pile		per wall width		per pile		per pile		per wall width	
cm	in	kg/m	lbs/ft	kg/m²	lbs/ft²	cm⁴	in	cm⁴/m	in⁴/ft	cm	in	cm³	in³	cm³/m	in³/ft
2.64	1.04	36.5	24.5	91.2	18.7	429	10.3	3,820	28.0	3.04	1.20	66.4	4.05	509	9.47
2.78	1.09	35.5	23.9	88.8	18.2	454	10.9	4,220	30.9	3.17	1.25	64.7	3.95	527	9.80
3.45	1.36	35.5	23.9	88.8	18.2	598	14.4	4,500	33.0	3.64	1.43	88.0	5.37	529	9.84
3.62	1.43	48.0	32.3	120	24.6	986	23.7	8,690	63.6	4.01	1.58	121	7.38	869	16.2
4.04	1.59	48.0	32.3	120	24.6	1,240	29.8	8,740	64.0	4.50	1.77	152	9.28	874	16.3
3.86	1.52	43.2	29.0	108	22.1	1,070	25.7	9,680	70.9	4.42	1.74	120	7.32	880	16.4
4.72	1.86	43.2	29.0	108	22.1	1.460	35.1	10,600	77.6	5.15	2.03	160	9.76	880	16.4
4.72	1.86	60.0	40.3	150	30.7	1,920	46.1	16,400	120	5.01	1.97	196	12.0	1,310	24.4
4.90	1.93	60.0	40.3	150	30.7	2,220	53.3	16,800	123	5.39	2.12	223	13.6	1,340	24.9
5.71	2.25	58.4	39.2	146	29.9	2,700	64.9	22,800	167	5.12	2.02	238	14.5	1,520	28.3
5.84	2.30	58.4	39.2	146	29.9	2,790	67.0	22,800	167	6.12	2.41	250	15.3	1,520	28.3
5.85	2.30	76.0	51.1	190	38.9	2,690	88.7	31,900	234	6.15	2.42	311	19.0	2,060	38.3
6.45	2.54	76.1	51.1	190	38.9	4,670	112	38,600	283	6.94	2.73	362	22.1	2,270	42.2
6.51	2.56	74.0	49.7	185	37.9	4,380	105	39,400	389	6.81	2.68	330	20.1	2,250	41.8
7.45	2.93	74.0	49.7	185	37.9	5,300	127	41,600	305	7.50	2.95	400	24.4	2,250	41.8
6.15	2.42	105	70.6	250	51.2	5,950	143	55,200	404	6.67	2.63	433	26.4	3,150	58.6
6.94	2.73	105	70.6	210	43.0	7,960	191	63,000	461	7.71	3.04	520	31.7	3,150	58.6
8.09	3.18	120	80.6	240	49.2	11,400	271	86,000	630	8.63	3.40	680	41.5	3,820	71.1

Other available ranges :

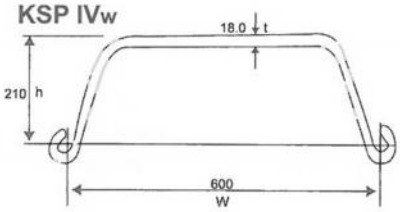
KSP IIw



KSP IIIw



KSP IVw



Section	Dimensions			Section Area		Unit weight		Moment of inertia		Modulus of section	
	W	h	t	A	A/m	M	M/m	I	I/m	Z_y	Z_y/m
	mm	mm	mm	cm^2	cm^2/m	kg/m	kg/m^2	cm^4	cm^4/m	cm^3	cm^3/m
KSP II_w	600	130	10.3	78.70	131.2	61.8	103	2,110	13,000	203	1,000
KSP III_w	600	180	13.4	103.9	173.2	81.6	136	6,220	32,400	376	1,800
KSP IV_w	600	210	18.0	135.3	225.5	106	177	8,630	56,700	539	2,700

Note : The sizes are also available in FSP sheet piles.
Sectional properties given per single pile, and per linear metre wall.

1) Grades Of Steel

Chemical composition and mechanical properties

Notation	Chemical Composition (%)									Tensile Strength (N/mm²)	Yield Point (N/mm²)	Elongation (%)	
	O	Si	Mn	P	S	Cu	Ni	O	Nb +V			Test Piece	
SY295	-	-	-	0.040 max.	0.040 max.	0.25 min.	-	-	-	490 min	294 min	JIS No. 1A	17 min
SY390	-	-	-	0.040 max	0.040 max	0.25 min	-	-	-	539 min	392 min	JIS No. 1A	15 min
CR4C490	0.20 max.	0.55 max.	1.20 max.	0.070 - 0.15	0.040 max.	0.20 min.	0.65 max.	0.30 - 0.80	0.15 max.	JIS No. 1A	17 min		

Note: * Mo, Ti and other element added as necessary

2) Dimensional Tolerances

JIS A 5528 : 2000		
HOT ROLLED STEEL SHEET PILE "U" SHAPE		
Dimension		**Tolerance**
Height		±4%
Width (B)		+ 10 - 5
Thickness	t < 10 10 ≤ t < 16 t ≥ 16	± 1.0 ± 1.2 ± 1.5
Length (L)		+ Not Specified 0
Deflection	L ≤ 10m. L> 10m.	Full Length (M) x 0.12% max. Full Length - 10m. x 0.10% + 12mm. max
Camber	L ≤ 10m. L ≥ 10m.	Full Length (M) x 0.25% max. Full Length - 10m. x 0.20% + 20mm. max
Difference in vertically Cut Sections.		Within 4% of Width

Note: The deflection shall be in the direction parallel to the sheet pile wall and the camber shall be in the direction vertical to the sheet pile wall.