ArcelorMittal

Cold formed steel sheet piles

Edition 2013

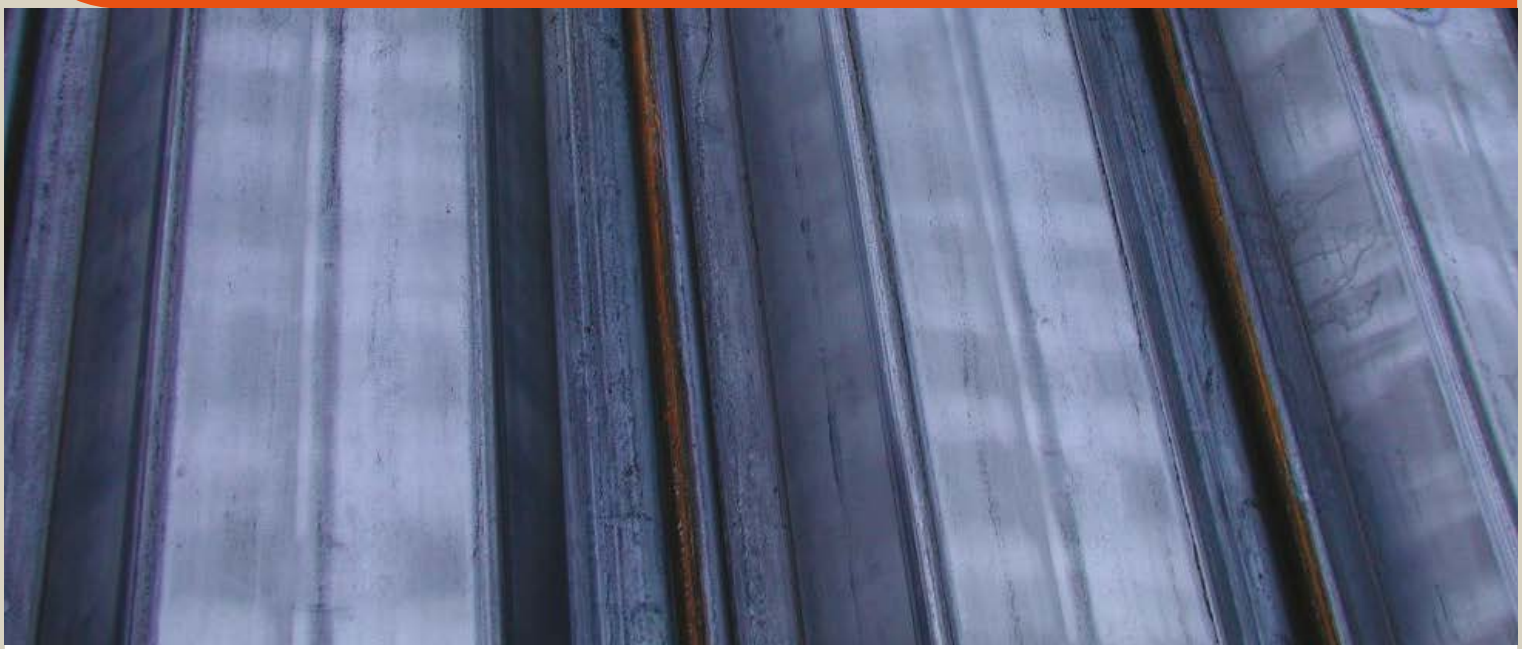
Zwolle | The Netherlands

Temporary cofferdam | Germany

Duisburg | Germany

Cover picture : Papenburg | Germany

Cold formed steel sheet piles
Edition 2013



Contents

Introduction

History

The story of the French MESSEMPRE mill site goes back to the beginning of the 19th century when Forges BOUTMY was founded. The presence of many forests in this area, along with a water reserve convertible into electrical power, made it an excellent location. Right from the end of the 19th century, MESSEMPRE was already widely renowned for its speciality: the famous "blue" steel sheets of the Ardennes. However, the destiny of the site lay elsewhere after the company DE WENDEL acquired it in 1912 and took it on a different industrial course: the production of thin steel sheets. Thereafter, industrial development played its part finally leading to the cold-forming of steel sheets in 1954, and later to the cold-forming of steel sheet piles as of 1955.

Several changes of ownership occurred over the years leading to the setting up of PALFROID in 1995. ProfilArbed was in charge of sales until 2001, year where Arbed, Aceralia and Usinor merged to create the No. 1 of Steel: Arcelor.
Since the creation of ArcelorMittal in 2006, ArcelorMittal Commercial RPS manages the sales of the cold formed sheet piles.

The company has been ISO 9001 certified since 2004 and its products comply with European Standard EN 10249, Parts 1 and 2.

MESSEMPRE mill is currently the European leader in terms of cold forming steel sheet piles.

Applications of cold formed steel sheet piles

Cold formed steel sheet piles have been used for decades in permanent and temporary structures, like waterfront structures, dykes, river embankments, cofferdams. Main applications are small retaining walls, temporary cofferdams requesting low watertightness, anchor walls of quay walls, reinforcement of dykes, river embankments, etc. The installation is quite simple and fast, and can be performed with a reduced driving team, standard driving methods and driving equipment, like impact hammers, vibratory hammers or hydraulic presses.

Main characteristics and properties of cold formed steel sheet piles

- Cover elastic section modulus range from 100 to 2 470 cm^3/m
- Constant thickness over the whole section, from 3 mm up to 10 mm (depending on the section)
- Good ratio elastic section modulus / mass
- High width, reducing handling and installation time
- Reduced depth (of some sections) for structures facing space limitations
- Angle deviations of the interlocks of 10°
- Shear force transfer on neutral axis is guaranteed (important issue for U-type sheet piles)
- Corner sections can be supplied with pre-bent or fabricated sheet piles
- PAL 32 and PAU 27 are well suited for reuse
- Can be coated or protected according to international standards (for instance EN 12944)
- Supplied according to European standard EN 10249
- Steel grades available: S 235 JRC, S 275 JRC and S 355 J0C

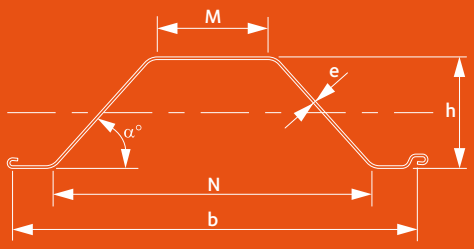
Flexible production capacities

- Several sections in different thicknesses, lengths and steel grades are available on stock, allowing very short delivery times of one to two weeks.
- A large stock of coils from 3 mm to 10 mm for the production of main sections. Delivery from 4 to 6 weeks time.
- Any sheet pile section can be manufactured in thickness increments of 0.1 mm (up to the maximum thickness of the specific section). Delivery time including lead time for the supply of the coils: less than 8 weeks.

Cold-forming of Omega section

Cutting of interlocks with a saw.

Omega Sections



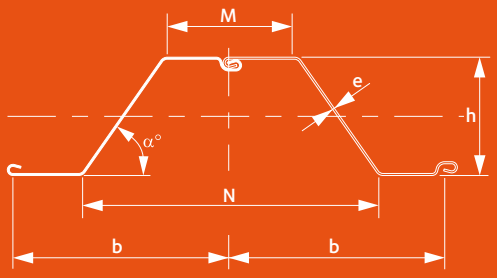
Omega sections are quite suited for the execution of continuous walls that have a limited profile height. The 'inversed' interlocks allow the installation of relatively shallow structures.
Their shape has been optimized in order to achieve an excellent ratio section modulus / mass, with section modulus up to 1 100 cm^3/m.

Section	Thickness (*)	Width	Height	Angle	Additional dimensions		Mass		Moment of inertia	Elastic section modulus	Static moment	Sectional area	Coating area (**)
	e mm	b mm	h mm	α °	M mm	N mm	kg/m of single pile	kg/m^2 of wall	I cm^4/m	W_{el} cm^3/m	S cm^3/m	A cm^2/m	A_{Lw} m^2/m
PAL 3030	3.0	660	89	41	260	466	19.4	**29.4**	500	**112**	65	37.5	0.80
PAL 3040	4.0	660	90	41	260	466	25.8	**39.2**	666	**147**	85	49.9	0.80
PAL 3050	5.0	660	91	41	260	466	32.2	**48.8**	831	**181**	105	62.2	0.80
PAL 3130	3.0	711	125	79	350	419	23.5	**33.1**	1 244	**199**	110	42.2	0.97
PAL 3140	4.0	711	126	79	350	419	31.3	**44.0**	1 655	**261**	145	56.1	0.97
PAL 3150	5.0	711	127	79	350	419	39.0	**54.9**	2 063	**322**	180	70.0	0.97
PAL 3260	6.0	700	149	61	299	471	46.2	**66.0**	3 096	**413**	245	84.1	0.92
PAL 3270	7.0	700	150	61	299	471	53.2	**76.0**	3 604	**479**	285	96.8	0.92
PAL 3280	8.0	700	151	61	299	471	61.6	**88.0**	4 109	**545**	325	112.1	0.92
PAL 3290	9.0	700	152	61	299	471	70.0	**100.0**	4 611	**605**	365	127.4	0.92
PAU 2240	4.0	921	252	48	252	725	39.0	**42.3**	5 101	**404**	240	53.9	1.22
PAU 2250	5.0	921	253	48	252	725	48.7	**52.8**	6 363	**504**	300	67.3	1.22
PAU 2260	6.0	921	254	48	252	725	58.3	**63.3**	7 620	**600**	360	80.7	1.22
PAU 2440	4.0	813	293	60	252	615	39.0	**48.0**	7 897	**537**	320	61.1	1.22
PAU 2450	5.0	813	294	60	252	615	48.7	**59.9**	9 858	**669**	395	76.3	1.22
PAU 2460	6.0	813	295	60	252	615	58.3	**71.8**	11 813	**801**	475	91.4	1.22
PAU 2760	6.0	804	295	60	252	615	60.4	**75.1**	12 059	**803**	495	95.7	1.16
PAU 2770	7.0	804	296	60	252	615	70.4	**87.5**	14 030	**934**	575	114.4	1.16
PAU 2780	8.0	804	297	60	252	615	80.3	**99.8**	15 995	**1 063**	655	127.1	1.16

* Other thicknesses on request
** One side, excluding inside of interlocks


Temporary structure | Airport Leipzig-Halle | Germany

Z-Sections

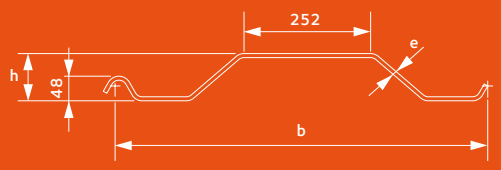


PAZ sections are the most cost-effective type of cold formed steel sheet piles. Their high width reduces significantly the installation time at the job site. They are particularly well adapted for reinforcing dams and river or canal banks. Elastic section modulus up to 2 500 cm³/m.

Section	Thickness (*)	Width	Height	Angle	Additional dimensions		Mass		Moment of inertia	Elastic section modulus	Static moment	Sectional area	Coating area (**)
	e mm	b mm	h mm	α °	M mm	N mm	kg/m of single pile	kg/m² of wall	I cm⁴/m	W_{el} cm³/m	S cm³/m	A cm²/m	A_{Lw} m²/m
PAZ 4350	5.0	770	213	34	465	1 078	38.2	**49.6**	4 770	**448**	255	63.2	0.91
PAZ 4360	6.0	770	214	34	465	1 078	45.8	**59.4**	5 720	**534**	310	75.1	0.91
PAZ 4370	7.0	770	215	34	465	1 078	53.3	**69.2**	6 660	**619**	360	88.2	0.91
PAZ 4450	5.0	725	269	45	444	988	37.7	**52.0**	8 240	**612**	350	66.2	0.91
PAZ 4460	6.0	725	270	45	444	988	45.1	**62.2**	9 890	**730**	415	79.3	0.91
PAZ 4470	7.0	725	271	45	444	988	52.4	**72.3**	11 535	**846**	485	92.1	0.91
PAZ 4550	5.0	676	312	55	444	890	37.7	**55.8**	12 065	**772**	435	71.0	0.91
PAZ 4560	6.0	676	313	55	444	890	45.1	**66.7**	14 444	**922**	520	85.0	0.91
PAZ 4570	7.0	676	314	55	444	890	52.4	**77.5**	16 815	**1 069**	610	98.8	0.91
PAZ 4650	5.0	621	347	65	438	778	37.7	**60.7**	16 318	**940**	530	77.3	0.91
PAZ 4660	6.0	621	348	65	438	778	45.1	**72.6**	19 544	**1 122**	635	92.5	0.91
PAZ 4670	7.0	621	349	65	438	778	52.4	**84.4**	22 756	**1 302**	740	107.5	0.91
PAZ 5360	6.0	857	300	37	453	1 245	54.3	**63.3**	11 502	**766**	450	80.7	1.04
PAZ 5370	7.0	857	301	37	453	1 245	63.2	**73.7**	13 376	**888**	520	93.9	1.04
PAZ 5380	8.0	857	302	37	453	1 245	72.1	**84.0**	15 249	**1 009**	595	107.1	1.04
PAZ 5390	9.0	857	303	37	453	1 245	81.0	**94.4**	17 123	**1 131**	665	120.3	1.04
PAZ 5460	6.0	807	351	45	442	1 149	53.9	**66.8**	16 989	**968**	560	85.1	1.04
PAZ 5470	7.0	807	352	45	442	1 149	62.6	**77.6**	19 774	**1 123**	655	98.9	1.04
PAZ 5480	8.0	807	353	45	442	1 149	71.4	**88.4**	22 546	**1 277**	745	112.7	1.04
PAZ 5490	9.0	807	354	45	442	1 149	80.2	**99.3**	25 318	**1 431**	835	126.5	1.04
PAZ 54100	10.0	808	355	45	442	1 149	89.2	**110.3**	27 850	**1 570**	920	140.5	1.04
PAZ 5560	6.0	743	407	55	438	1 020	53.9	**72.5**	25 074	**1 233**	710	92.4	1.04
PAZ 5570	7.0	743	408	55	438	1 020	62.6	**84.3**	29 179	**1 432**	825	107.4	1.04
PAZ 5580	8.0	744	409	55	438	1 020	71.4	**96.0**	33 263	**1 628**	940	122.3	1.04
PAZ 5590	9.0	744	410	55	438	1 020	80.2	**107.8**	37 387	**1 825**	1 060	137.3	1.04
PAZ 55100	10.0	745	410	55	438	1 020	89.2	**119.8**	41 060	**2 000**	1 165	152.6	1.04
PAZ 5660	6.0	671	451	65	434	875	53.9	**80.3**	34 340	**1 525**	875	102.3	1.04
PAZ 5670	7.0	671	452	65	434	874	62.6	**93.3**	39 954	**1 770**	1 020	118.9	1.04
PAZ 5680	8.0	672	453	65	434	874	71.4	**106.3**	45 537	**2 013**	1 160	135.4	1.04
PAZ 5690	9.0	672	454	65	434	874	80.2	**119.3**	51 180	**2 259**	1 300	151.9	1.04
PAZ 56100	10.0	673	455	65	434	874	89.2	**132.5**	56 200	**2 470**	1 435	168.8	1.04

* Other thicknesses on request
** One side, excluding inside of interlocks

Trench sheets



Trench sheets are used to form a continuous wall through the overlapping. The main types of applications are sewerage and drainage works, and particularly sheeting for small excavations and temporary works. They are indispensable structural elements that provide protection for the job-site personnel working within enclosed areas.

Section	Thickness (*)	Width	Height	Mass		Moment of inertia	Elastic section modulus	Static moment	Sectional area	Coating area (**)
	e mm	b mm	h mm	kg/m of single pile	kg/m² of wall	I cm⁴/m	W_{el} cm³/m	S cm³/m	A cm²/m	A_{Lw} m²/m
RC 8600	6.0	742	92	40.9	**55.1**	896	**194**	116	70.2	0.87
RC 8700	7.0	742	93	47.6	**64.2**	1 045	**224**	135	81.8	0.87
RC 8800	8.0	742	94	54.2	**73.0**	1 194	**254**	154	93.0	0.87

* Other thicknesses on request
** One side

Temporary structure | Cheppy | France

Characteristics

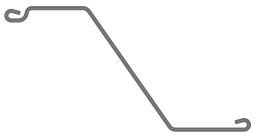
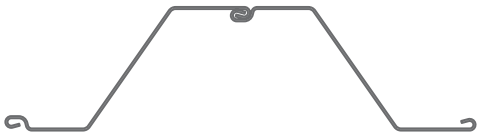
Small lock

Large lock

There are two interlock shapes: a "small" lock and a "large" lock. The shape of the geometry of cold formed sheet piles depends among other on the thickness of the sheet pile. The table below shows the threading compatibility of the different sections.

Delivery form

Omega Sections	Form II standard	Form I on request
		

Z-Sections	Position A	Position B
		
	Form II standard	Form I on request
		

Threading compatibility

Series		PAL			PAU			PAZ							
		30	31	32	22	24	27	43	44	45	46	53	54	55	56
PAL	30	✓	✓												
	31	✓	✓												
	32			✓			✓								
PAU	22				✓	✓									
	24				✓	✓									
	27			✓			✓					✓	✓	✓	✓
PAZ	43							✓	✓	✓	✓				
	44							✓	✓	✓	✓				
	45							✓	✓	✓	✓				
	46							✓	✓	✓	✓				
	53						✓					✓	✓	✓	✓
	54						✓					✓	✓	✓	✓
	55						✓					✓	✓	✓	✓
	56						✓					✓	✓	✓	✓

Welds

PAZ sheet piles are usually delivered threaded in pairs with the common interlock partially welded at regular intervals by 150 mm long welds. The number of welds depends on the length of the sheet piles.

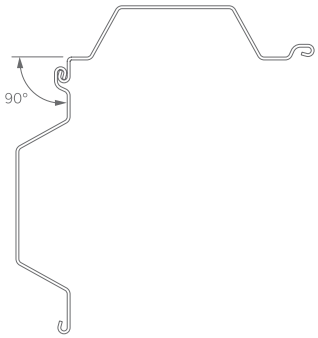
Welds of Z- Sections

Length of section L m	Number of welds
L ≤ 3.0	2
3.0 < L ≤ 8.0	3
8.0 < L ≤ 12.0	4
12.0 < L	5

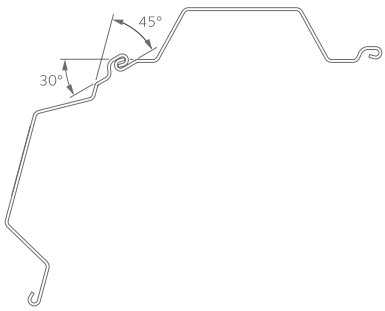
Special piles

PAZ, PAL and PAU sections can be adapted to any geometrical arrangement, by welding or bending of the piles.
Do not hesitate to contact us with any specific request.

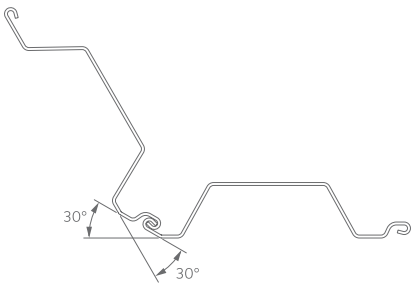
90° and 0° bent assembly



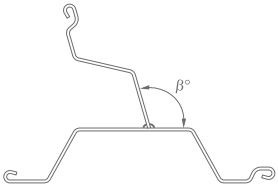
45° and 30° bent assembly



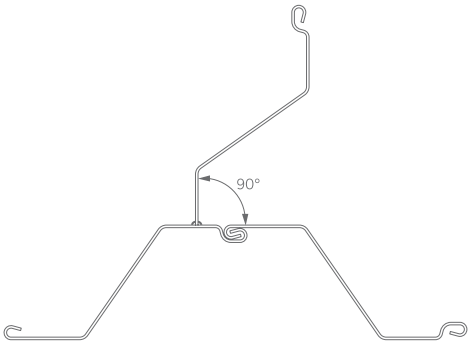
30° et 30° bent assembly

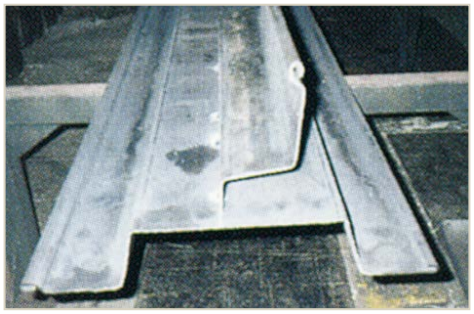


PAL or PAU welded assembly



PAZ welded T assembly





Delivery conditions

Steel grades

PAZ, PAU and PAL sections, as well as trench sheets are available in the steel grades according to EN 10249-1:

Steel grade EN 10249-1 (*)	Min. yield strength R_{eH} MPa	Min. tensile strength R_m MPa	Min. elongation $L_o=5.65\sqrt{S_o}$ %
S 235 JRC	235	360 - 510	26
S 275 JRC	275	410 - 560	23
S 355 J0C	355	470 - 630	22

(*) Mechanical properties according to EN 10025-2:2004.
Other steel grades available on request.

Maximum thickness per type of sheet pile

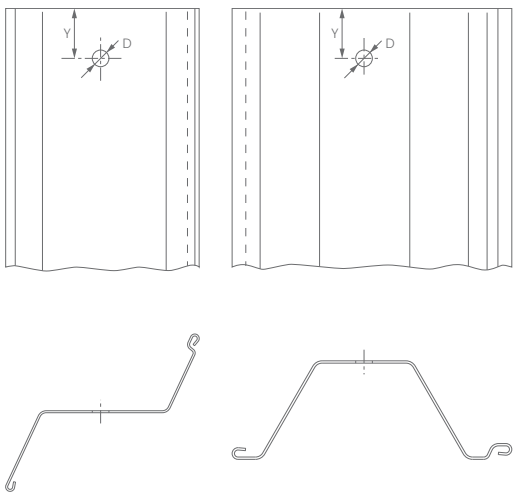
Series		Steel grade		
		S 235 JRC	S 275 JRC	S 355 J0C
PAL	30	5.0	5.0	5.0
	31	5.0	5.0	5.0
	32	9.0	9.0	8.0
PAU	22	6.0	6.0	6.0
	24	6.0	6.0	6.0
	27	8.0	8.0	7.0
PAZ	43	7.0	7.0	7.0
	44	7.0	7.0	7.0
	45	7.0	7.0	7.0
	46	7.0	7.0	7.0
	53	9.0	9.0	8.0
	54	10.0	9.0	8.0
	55	10.0	9.0	8.0
	56	10.0	9.0	8.0

Handling holes

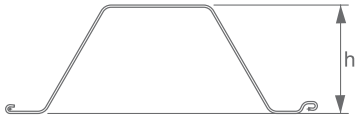
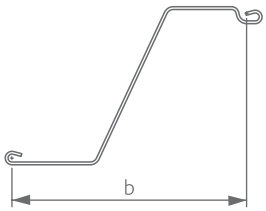
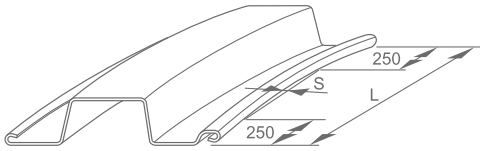
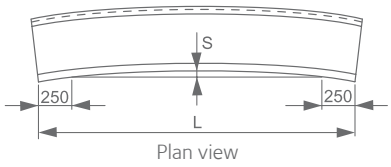
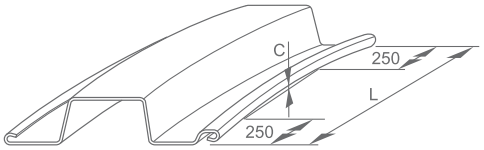
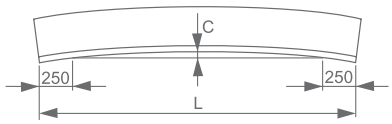
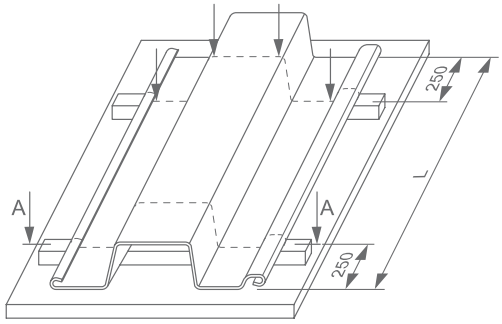
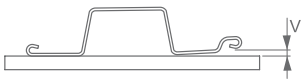
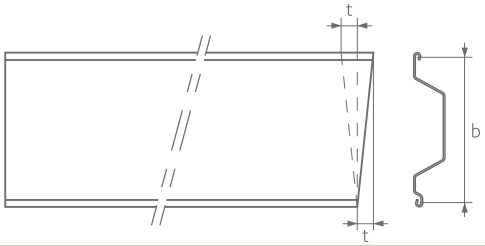
All sheet pile sections can be supplied with a handling hole. Standard dimensions are as follows:

	Diameter D mm	Distance Y mm
PAL 30-31	40	150
PAL 32	45	150
PAU	45	200
PAZ	50	200

Different dimensions on request.



Tolerances of sheet piles according to EN 10249

Characteristics	Figures	Nominal size	Tolerances
Height Height h		h ≤ 200 mm 200 < h ≤ 300 300 < h ≤ 400 400 < h	± 4 mm ± 6 mm ± 8 mm ± 10 mm
Width Width b		Single sheet piles Double sheet piles	± 2% b ± 3% b
Wall thickness Thickness e The tolerances on the wall thickness of the profiles shall comply with the requirements of table 3 of EN 10051, for a nominal width of strip and sheet over 1800 mm.		e = 3.00 mm 3.00 < e ≤ 4.00 4.00 < e ≤ 5.00 5.00 < e ≤ 6.00 6.00 < e ≤ 8.00 8.00 < e ≤ 10.00	± 0.26 mm ± 0.27 mm ± 0.29 mm ± 0.31 mm ± 0.35 mm ± 0.40 mm
Bending Bow-height S	  Plan view		0.25% L
Curving Bow-height C	  Elevation		0.25% L
Twisting Dimension V	  Section A-A		±2% L or 100 mm max.
Length Length L Normal tolerance (*)			± 50 mm
Squareness of ends Out-of-squareness t of end cuts			± 2% b
Mass Difference between the total actual mass and the total calculated mass delivered (*)			± 7%

* Reduced tolerances are available on request

Durability

Unprotected steel in the atmosphere, in water or in soil is subject to corrosion that in extremely unfavourable cases can lead to severe damages. Local weakening and perforation are normally considered to be maintenance problems. They can be fixed locally when they appear. However, depending on lifetime requirements and accessibility of the structure, one or a combination of the following methods can improve the durability of the sheet piles and contribute to the achievement of the service life:

- corrosion protection by surface coating,
- choice of a stronger section or of a higher steel grade,
- avoiding important bending moments in the zone prone to high corrosion rates,
- corrosion protection by Hot-Dip Galvanizing.

The corrosion rate of steel depends on the exposure area. For more information, please refer to Chapter 4 of EN 1993-5 (2007).

Surface coating

The classical corrosion protection for steel sheet piling is surface coating. EN ISO 12944 deals with protection by paint systems and its various parts cover all the features that are important in achieving adequate corrosion protection. It is essential that the steel surface is properly prepared.
In order to meet the requirements of the market, all our products can be delivered with a surface suited to their intended use. We can offer a full range of surface treatments, from the most simple to the most sophisticated: from a simple application of a primer after shot blasting to a more complex protection with multiple coat layers.
Our know-how also enables us to meet special requests: special coatings or treatments on a portion of the sheet pile length. For aesthetic reasons, the final coating layer is sometimes applied only on the visible parts of the sheet piles.

Hot-Dip Galvanizing

The process consists in dipping the steel to be coated into liquid zinc after adequate surface preparation, thereby creating a steel-zinc alloy on the steel surface and providing a pure zinc layer on the whole surface. Surface preparation is made by submitting the steel to a pickling bath (acid) and a flux treatment (chlorides). The zinc bath has a temperature of 450°C and the minimum thickness of the finished zinc layer is 85 µm, in compliance with EN ISO 1461.

If a paint system is applied on the galvanization, it is referred to as a "Duplex" system. The paint system that is foreseen on the zinc layer must be compatible with the hot dip galvanization.

Note : Galvanization of the finished product has an influence on the chemical composition of the steel. Therefore this surface treatment must be notified to the mill already at the enquiry phase.

Watertightness

Steel sheet piles are impervious. The only possibility of water seeping through a sheet pile wall is by flowing through the interlock. The interlock naturally provides seepage resistance due to its shape. Sealing systems are therefore not necessarily required for applications such as temporary retaining walls where moderate rates of seepage are acceptable. If medium to high seepage resistance is required, e.g. cut-off walls for contaminated sites, retaining structures for bridge abutments or tunnels, double sheet piles with sealed or welded joints are recommended.

Watertightness of cold formed sheet pile walls can be improved by using a bituminous filler: **"Beltan"**, which can withstand a maximal water pressure of 100 kPa.
The more expensive alternative is a continuous seal-weld done on site after installation of the sheet piles (on the portion accessible after installation).

Installation

The installation of cold formed steel sheet piles is simple and quick. It can be done with a reduced driving crew. State-of-the-art driving techniques require an adapted driving equipment. The choice of the driving procedure and equipment will depend essentially on the sheet pile section characteristics, steel grade, length, and the soil properties.
Driving equipment can be subdivided in three main categories:

- **impact hammers** are the oldest equipment used to install steel sheet piles into the ground. It consists in driving a stiff element into the soil with a massive ram, which mass and drop height is chosen based on the section and soil properties. There are three main types of impact hammers: single or double impact hydraulic hammers, diesel hammers and more old-fashioned 'rapid-blow' impact hammers.
- **vibratory hammers** induce a vertical vibration of the sheet pile element, reducing significantly the friction and adhesion between the soil and the surface of the driven element. It is a most cost-effective installation technique in granular soils, like sands and gravels, especially when they are saturated, as well as in soft to firm cohesive soils.
- **hydraulic presses** were developed in order to allow installation of sheet piles without vibrations and with a considerable reduction of noise. They are especially recommended in sensitive environments, like urban areas, although it is slower and although the installation costs are generally higher compared to the previous two methods. This technique is quite effective in loose to medium dense granular soils and soft to firm cohesive soils.

The most effective driving method is the 'panel' driving, but it is also more expensive and time-consuming than the 'pitch & drive' method, which consists in driving each element straight to the final elevation

Installation may be facilitated by driving assistance techniques, the most well known of which are pre-drilling and jetting. The latter operation involves injecting water under pressure at the toe of the sheet pile during driving, and is quite effective in dense sand layers.

Please contact our technical department for further information on these topics.

Design values according to EN 1993-5

	Section	W_{el} cm³/m	W_{pl} cm³/m	Class[1] S 235 JRC	Class[1] S 275 JRC	Class[1] S 355 JOC	M_k[2] kNm/m S 235 JRC	M_k[2] kNm/m S 275 JRC	M_k[2] kNm/m S 355 JOC
Omega sections	PAL 3030	112	-	4	4	4	21	24	29
	PAL 3040	147	-	4	4	4	31	35	43
	PAL 3050	181	-	4	4	4	42	48	59
	PAL 3130	199	-	4	4	4	29	33	40
	PAL 3140	261	-	4	4	4	45	51	63
	PAL 3150	322	-	4	4	4	63	70	86
	PAL 3260	413	-	4	4	4	95	108	133
	PAL 3270	479	-	3	3	4	118	135	167
	PAL 3280	545	624	2	3	3	139	159	200
	PAL 3290	605	696	2	2	3	160	184	233
	PAU 2240	404	-	4	4	4	84	95	111
	PAU 2250	504	-	4	4	4	116	133	161
	PAU 2260	600	-	3	3	4	150	170	212
	PAU 2440	537	-	4	4	4	111	124	148
	PAU 2450	669	-	4	4	4	154	174	212
	PAU 2460	801	-	3	3	4	197	224	279
	PAU 2760	803	-	3	3	4	198	226	276
	PAU 2770	934	1 136	2	3	3	243	280	346
	PAU 2780	1 063	1 293	2	2	3	289	333	416

W_{el}: Elastic section modulus

W_{pl}: Plastic section modulus

[1]Classification according DIN EN 1993-5. Class 1 is obtained by verification of the rotation capacity for a class-2 cross-section.

[2]The characteristic bending moment resistance M_k in pure bending was determined with a 4-point bending test and through numerical simulations using a finite element software ("Gutachten Nr. 10-35" of the IFSW institute in Germany). The design value of the bending moment resistance can be calculated with the formula $M_d = M_k / \gamma_{M0}$ where γ_{M0} is specified in the National Application document (NA) of EN 1993-5 or $\gamma_{M0} = 1.0$ according to EN 1993-5:2007 in the absence of a NA document.

x)Section not available in this steel grade

	Section	W_{el} cm³/m	W_{pl} cm³/m	Class[1] S 235 JRC	Class[1] S 275 JRC	Class[1] S 355 JOC	M_k[2] kNm/m S 235 JRC	M_k[2] kNm/m S 275 JRC	M_k[2] kNm/m S 355 JOC
Z - Sections	PAZ 4350	448	-	4	4	4	77	83	94
	PAZ 4360	534	-	4	4	4	95	104	118
	PAZ 4370	619	-	3	4	4	114	124	142
	PAZ 4450	612	-	4	4	4	126	139	156
	PAZ 4460	730	-	4	4	4	158	174	197
	PAZ 4470	846	-	3	4	4	189	209	239
	PAZ 4550	772	-	4	4	4	172	192	220
	PAZ 4560	922	-	4	4	4	213	239	279
	PAZ 4570	1 069	-	3	4	4	254	287	338
	PAZ 4650	940	-	4	4	4	220	251	298
	PAZ 4660	1 122	-	4	4	4	269	308	374
	PAZ 4670	1 302	-	3	4	4	319	365	451
	PAZ 5360	766	-	4	4	4	169	187	213
	PAZ 5370	888	-	3	4	4	201	223	256
	PAZ 5380	1 009	-	3	3	4	232	259	299
	PAZ 5390	1 131	-	3	3	3	265	296	344
	PAZ 5460	968	-	4	4	4	231	261	307
	PAZ 5470	1 123	-	3	4	4	274	310	369
	PAZ 5480	1 277	-	3	3	4	317	360	431
	PAZ 5490	1 431	-	3	3	3	361	408	493
	PAZ 54100	1 570	1 840	2	x	x	-	x	x
	PAZ 5560	1 233	-	4	4	4	304	349	426
	PAZ 5570	1 432	-	3	4	4	360	413	509
	PAZ 5580	1 628	-	3	3	4	415	477	590
	PAZ 5590	1 825	-	3	3	3	471	541	673
	PAZ 55100	2 000	2 330	2	x	x	-	x	x
	PAZ 5660	1 525	-	4	4	4	378	435	542
	PAZ 5670	1 770	-	3	4	4	446	515	645
	PAZ 5680	2 013	-	3	3	4	514	594	746
	PAZ 5690	2 259	-	3	3	3	583	671	848
	PAZ 56100	2 470	2 865	2	x	x	-	x	x

Disclaimer

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