ArcelorMittal

The HZ®-M Steel Wall System

Imperial units

The development of the HZ®-M Steel Wall System

The race to build larger vessels for the transport of containers and bulk cargo around the world has resulted in an increase of the draught of major ports, and consequently the need for more heavy-load berthing facilities has arisen. To cope with these deeper structures, conventional steel sheet piles have been replaced with "combined walls" which consist of two complementary elements: a primary element (king pile) and a secondary element (intermediary sheet pile).

Aware of this inescapable evolution in the main application field for the high range of conventional steel sheet piles, "Arbed" (ArcelorMittal since 2007) in Luxembourg started producing the **HZ-ZH** combined wall system in the 1970's. Quickly this system imposed itself as the first choice for the construction of new quay walls in major ports of Germany, Italy, the USA and many emerging economies.

Later in the 1990's, the development of the AZ steel sheet piles led to an improvement of the system: introduction of new HZ king piles that were available in different thicknesses, in combination with these AZ sheet piles as intermediary infill sheet piles. This **HZ/AZ** system encountered a matchless success and is still being used all over the world, in most large ports, in deep excavations, in deep watertight cofferdams, etc. Shipments of the HZ/AZ steel wall system during the last years confirmed this evolution.

At the beginning of the XXI century, trends continued evolving towards larger sea-going vessels. Loads on the future berths were expected to continue to increase. Several new mega-ports were on the planning stage, most existing ports were expanding their capacities. Those investments would have required the execution of a large amount of new quay walls and the deepening of existing ones. New types of applications required larger high-capacity retaining walls.

As a consequence, a shortage of production capacity of the HZ/AZ combined walls was predicted for the long-term. In order to continue to supply state-of-the-art and competitive foundation solutions, the new challenge faced by ArcelorMittal was developing deeper hot rolled HZ sections with thicker flanges, and providing a substantial increase in productivity and production capacity, as well as being more cost-effective. For this development, an incredible amount of parameters and constraints had to be considered by our R&D.

In 2007, we launched the final research project. Many technical solutions were analysed, then several promising alternatives were investigated in detail in order to select the best choice: **a technically outstanding and proven system** based on existing experience and technology, and **economically a highly competitive solution** compared to existing systems and alternative construction methods and materials.

The HZ®-M Steel Wall concept consists in **hot rolling a wide flange beam, the HZ®-M, with variable thickness of the flange, and subsequently milling a groove into the flanges**, on which a connector is threaded. The finished product is quite similar to the previous HZ/AZ system.

This innovative system requires specialised milling equipment that was engineered and built for this high-precision task. The best suppliers were challenged to design and provide this exclusive milling instrument that would guarantee both a higher production capacity and productivity compared to the existing solution.

An additional advantage is that due to the tight milling tolerances which are achieved, a tighter and better mechanical connection between the flange of the king pile and the hot rolled connectors RH/RZ can be obtained.

Less than one year later, in 2008, ArcelorMittal was proud to supply just-in-time the first HZ®-M in a HZ®-M steel wall system for a huge project in Northern Germany. It proved to be a vast challenge mastered through excellent collaboration between several departments in Luxembourg: R&D, the rolling mill, the technical and the sales departments. The flexibility of the system has been further increased by extending the HZ-M range with the HZ 680M LT section in 2013.

Since 2015, with the introduction of the AZ-800 sections, new infill sheet piles are available which have further improved the competitiveness of the HZ®-M system. In 2019, the HZ 680M LT section was replaced by the new HZ 630M profile, to comply with the demand for stronger combined steel walls with construction height constraints.

We never doubted the success of this system and are confident that our customers will find within our large range of HZ/AZ combinations the most competitive solution for their project.

In 2019, ArcelorMittal has already delivered more than 1 million tonnes of the HZ/AZ system around the world: Brazil, Canada, France, Germany, Italy, Mexico, Nigeria, Poland, Russia, South Africa, The Netherlands, UK and USA, just to mention a few.

Launched in 2021, the **EcoSheetPile™ Plus** label certifies that the steel sheet piles are **produced from 100% recycled steel and 100% certified renewable electricity**.

This is covered by an Environmental Product Declaration (EPD), based on dedicated life-cycle analysis. EcoSheetPile™ Plus is an essential part of ArcelorMittal's **XCarb™ recycled and renewably produced** initiative to reach carbon neutrality by 2050.

The HZ®-M Steel Wall System

The HZ-M Steel Wall System is one of the most preferred solutions for port structures and other deep excavations. It is an HZ/AZ combined wall system that comprises the following elements:

- HZ-M king pile elements, fulfilling two different structural functions: withstand soil and hydrostatic pressures as well as bear vertical loads;
- a pair of AZ sheet piles as an intermediary element that has a soil-retaining and load-transferring function and is generally shorter than the HZ-M king piles;
- special hot rolled connectors (RH, RZD, RZU) connecting infill sheet piles and HZ-M king piles to guarantee a continuous wall.

The general concept of the HZ®-M Steel Wall System is based on a stiff king pile with light intermediary sheet piles resulting in an overall safe and cost-effective high capacity retaining structure, with a high stiffness and high bending moment capacity.

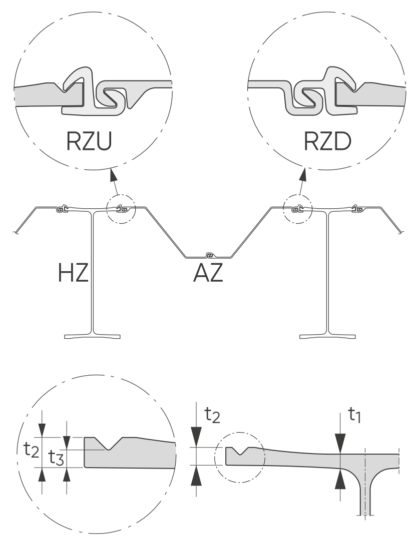
The main advantage of HZ-M king piles is the concave geometry of the flanges of the lighter sections, and the unmatched flange thickness of the heavier king pile sections with up to 1.57 in.

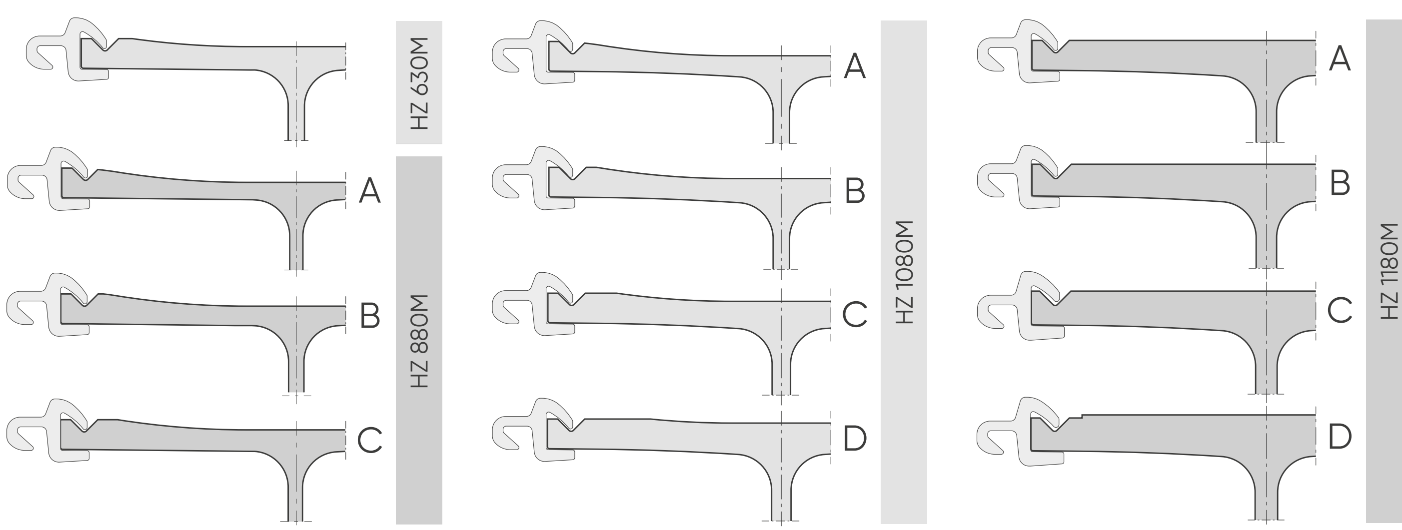
To thread the RH/RZ connectors, a groove is milled into the flange. The milling equipment was designed to guarantee very tight tolerances of the groove, which improves interlocking of the connection and ensures sufficient residual steel thickness t_3. The groove is milled if required; flanges without connectors are not milled.

The connectors are threaded over the mill grooves of the HZ-M pile and partially welded, thus increasing the stiffness and the section modulus of the whole wall. Unlike other combined wall system, the geometry of the connectors ensures a “mechanical connection” between the two elements of the HZ/AZ system and guarantees the continuity of the wall without relying on the welding of the connectors.

Additionally, the HZ/AZ system presents advantages compared to equivalent tube-combiwalls:

- it forms an almost straight wall on the water side/ excavation side;
- the depth of the HZ/AZ system is shallower, which is an advantage in tight situations (for instance, when installing a wall in front of an existing berthing facility);
- less impact of sea water corrosion on lifetime design (only front side flange of the HZ-M is exposed to sea water);
- the mechanical connection of RZ interlocks to the HZ-M beams provide additional safety, e.g. in case of corrosion of the fixation welding;
- the construction of the capping beam is easier and requires less concrete;
- anchoring of the HZ-M is more simple (see specific paragraph on page 31).

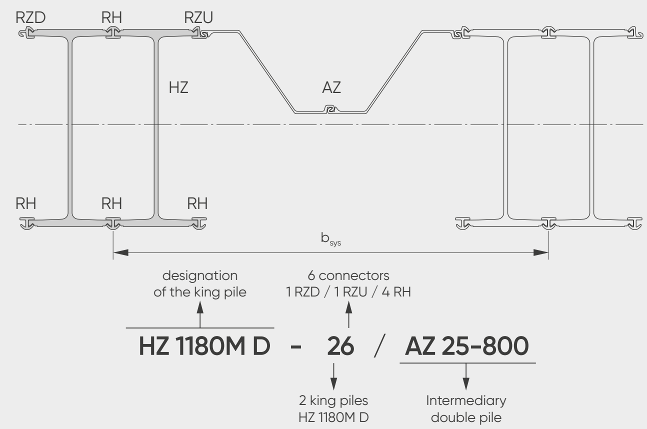




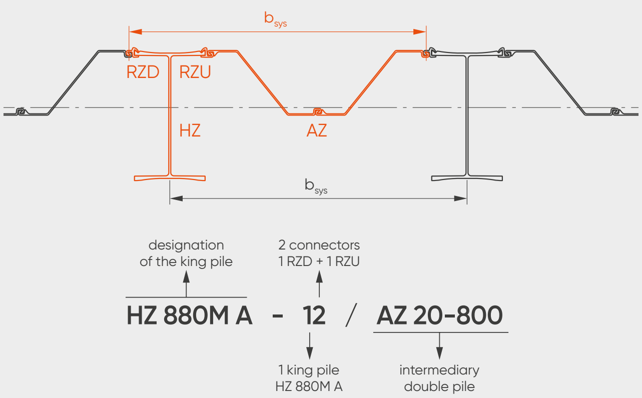
Definition of the HZ®-M Steel Wall System

The outstanding feature of the HZ/AZ combined wall system is the extensive collection of possible combinations using the entire AZ sheet pile range (6 solutions for each HZ-M section; AZ range including all rolled-up and rolled-down AZ sections). The combinations are based on the same principle: structural supports comprising 1 or 2 HZ-M king pile sections alternating with intermediary double AZ sheet pile sections, or as alternative without any infill sheet piles.

In this brochure, to limit the number of pages, the tables are restricted to the main infill sheet pile options from our AZ rolling program, but data for other combinations are available on request.



Denomination of the HZ-M Steel Wall System:



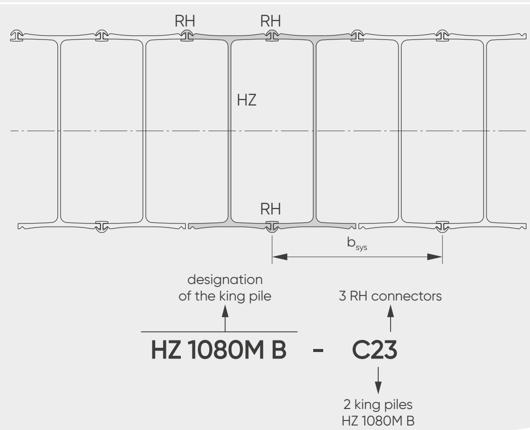
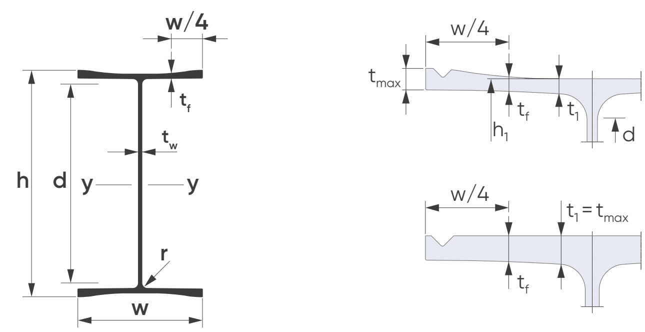


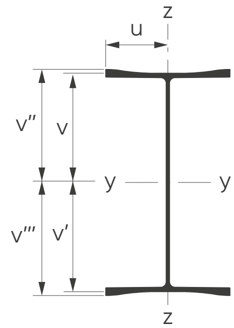
Fig.1. HZ/AZ steel wall system: definitions and designations.

HZ®-M - King piles



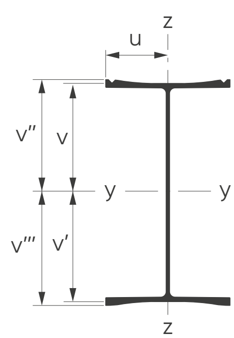
Section	h	h_1	d	w	t_1	t_{max}	t_f	t_w	r	A_v	Suitable connectors	
	in	in	in	in	in	in	in	in	in	in²		
HZ 630M	24.86	24.24	20.08	16.54	0.89	1.14	0.95	0.63	1.18	18.00	RZD/RZU 16	RH 16
HZ 880M A	32.73	31.63	27.94	18.03	0.67	1.14	0.74	0.51	1.18	18.60	RZD/RZU 16	RH 16
HZ 880M B	32.73	31.79	27.94	18.11	0.74	1.14	0.82	0.59	1.18	21.27	RZD/RZU 16	RH 16
HZ 880M C	32.73	31.94	27.94	18.11	0.82	1.14	0.90	0.59	1.18	21.54	RZD/RZU 16	RH 16
HZ 1080M A	42.33	41.24	37.23	17.87	0.81	1.14	0.77	0.63	1.18	28.80	RZD/RZU 16	RH 16
HZ 1080M B	42.33	41.47	37.23	17.87	0.93	1.14	0.89	0.63	1.18	29.18	RZD/RZU 16	RH 16
HZ 1080M C	42.33	41.71	37.23	17.95	1.05	1.14	1.01	0.71	1.18	32.76	RZD/RZU 16	RH 16
HZ 1080M D	42.33	42.02	37.23	17.99	1.21	1.21	1.17	0.75	1.18	34.89	RZD/RZU 16	RH 16
HZ 1180M A	42.34	-	37.23	18.03	1.37	1.36	1.22	0.79	1.18	37.02	RZD/RZU 16	RH 16
HZ 1180M B	42.50	-	37.23	18.03	1.44	1.44	1.30	0.79	1.18	37.29	RZD/RZU 16	RH 16
HZ 1180M C	42.65	-	37.23	18.07	1.52	1.52	1.38	0.83	1.18	39.17	RZD/RZU 18	RH 20
HZ 1180M D	42.81	-	37.23	18.11	1.60	1.60	1.46	0.87	1.18	41.06	RZD/RZU 18	RH 20

Solution 100



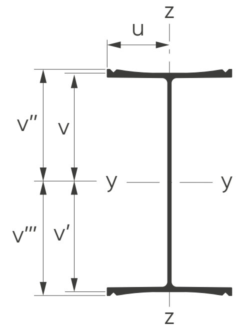
Section	Dimensions					Properties per solution										
	v	v'	v''	v'''	u	A	G	I_y	I_z	I_t	I_ω	$W_{el,y}$*	$W_{el,y}$**	$W_{el,z}$	A_{LW}	A_{LS}
	in	in	in	in	in	in^2	lb/ft	in^4	in^4	in^4	10^3in^6	in^3	in^3	in^3	ft^2/ft	ft^2/ft
HZ 630M	12.12	12.12	12.43	12.43	8.27	48.37	**164.59**	5306.2	822.2	14.4	109.68	**437.7**	-	99.4	1.38	7.97
HZ 880M A	15.82	15.82	16.36	16.36	9.02	46.47	**158.13**	8,714.0	961.1	9.6	225.84	**551.0**	-	106.6	1.51	9.67
HZ 880M B	15.89	15.89	16.36	16.36	9.06	51.52	**175.34**	9,578.3	1,027.8	12.4	243.06	**602.7**	-	113.5	1.51	9.68
HZ 880M C	15.97	15.97	16.36	16.36	9.06	53.76	**182.97**	10,155.3	1,065.8	14.4	253.85	**635.8**	-	117.7	1.51	9.68
HZ 1080M A	20.62	20.62	21.17	21.17	8.94	57.63	**196.13**	16,805.3	944.7	13.2	379.67	**815.1**	-	105.7	1.49	11.17
HZ 1080M B	20.74	20.74	21.17	21.17	8.94	61.26	**208.46**	18,373.8	1,016.2	16.5	411.73	**886.1**	-	113.7	1.49	11.17
HZ 1080M C	20.85	20.85	21.17	21.17	8.98	67.77	**230.62**	20,257.8	1,079.8	21.7	440.86	**971.4**	-	120.3	1.50	11.17
HZ 1080M D	21.01	21.01	21.17	21.17	9.00	73.04	**248.56**	22,093.2	1,127.5	27.8	465.16	**1,051.5**	-	125.3	1.50	11.17
HZ 1180M A	21.17	21.17	21.17	21.17	9.02	77.26	**262.92**	23,479.2	1,151.8	33.4	479.01	**1,109.1**	-	127.8	1.50	11.18
HZ 1180M B	21.25	21.25	21.25	21.25	9.02	80.09	**272.57**	24,755.0	1,228.6	38.2	513.05	**1,165.1**	-	136.3	1.50	11.20
HZ 1180M C	21.33	21.33	21.33	21.33	9.04	84.61	**287.95**	26,296.4	1,314.5	44.7	551.03	**1,233.0**	-	145.5	1.51	11.23
HZ 1180M D	21.41	21.41	21.41	21.41	9.06	89.14	**303.37**	27,852.9	1,401.5	52.3	589.56	**1,301.2**	-	154.8	1.53	11.24

Solution 102



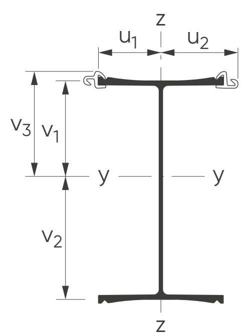
Section	Dimensions					Properties per solution										
	v	v'	v''	v'''	u	A	G	I_y	I_z	I_t	I_ω	$W_{el,y}$*	$W_{el,y}$**	$W_{el,z}$	A_{LW}	A_{LS}
	in	in	in	in	in	in^2	lb/ft	in^4	in^4	in^4	10^3in^6	in^3	in^3	in^3	ft^2/ft	ft^2/ft
HZ 630M	12.26	11.98	12.57	12.29	8.27	47.83	**162.77**	5,224.5	793.1	13.7	105.81	**426.2**	-	95.9	1.44	7.97
HZ 880M A	15.99	15.64	16.54	16.19	9.02	45.97	**156.46**	8,583.7	928.6	9.0	218.22	**536.9**	-	103.0	1.57	9.67
HZ 880M B	16.06	15.72	16.54	16.19	9.06	50.98	**173.51**	9,435.9	992.2	11.8	234.61	**587.4**	-	109.6	1.58	9.68
HZ 880M C	16.14	15.81	16.53	16.20	9.06	53.23	**181.14**	10,012.9	1,030.1	13.7	245.37	**620.5**	-	113.8	1.58	9.68
HZ 1080M A	20.80	20.44	21.34	20.99	8.94	57.15	**194.49**	16,590.8	913.4	12.6	367.05	**797.8**	-	102.2	1.55	11.17
HZ 1080M B	20.92	20.55	21.35	20.98	8.94	60.72	**206.63**	18,134.7	981.6	15.8	397.56	**866.8**	-	109.8	1.56	11.17
HZ 1080M C	21.02	20.69	21.34	21.00	8.98	67.23	**228.79**	20,018.9	1,044.9	21.0	426.44	**952.3**	-	116.4	1.56	11.17
HZ 1080M D	21.17	20.86	21.32	21.01	9.00	72.50	**246.73**	21,854.4	1,092.3	27.1	450.52	**1032.5**	-	121.4	1.56	11.17
HZ 1180M A	21.32	21.02	21.32	21.02	9.02	76.72	**261.08**	23,238.6	1,116.2	32.5	464.17	**1090.1**	-	123.8	1.57	11.18
HZ 1180M B	21.44	21.06	21.44	21.06	9.02	79.37	**270.13**	24,433.5	1,181.4	37.1	493.10	**1139.7**	-	131.0	1.58	11.20
HZ 1180M C	21.51	21.15	21.51	21.15	9.04	83.89	**285.51**	25,972.6	1,267.1	43.7	530.88	**1207.6**	-	140.2	1.58	11.23
HZ 1180M D	21.67	21.14	21.67	21.14	9.06	88.05	**299.66**	27,355.6	1,329.5	50.7	558.54	**1262.5**	-	146.8	1.60	11.24

Solution 104



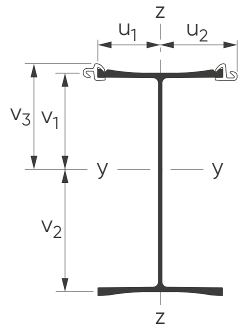
Section	Dimensions					Properties per solution										
	v	v'	v''	v'''	u	A	G	I_y	I_z	I_t	I_ω	$W_{el,y}$ *	$W_{el,y}$ **	$W_{el,z}$	A_{LW}	A_{LS}
	in	in	in	in	in	in^2	lb/ft	in^4	in^4	in^4	10^3in^6	in^3	in^3	in^3	ft^2/ft	ft^2/ft
HZ 630M	12.12	12.12	12.43	12.43	8.27	47.29	**160.94**	5,144.6	764.0	13.1	102.20	**424.4**	-	92.4	1.44	8.04
HZ 880M A	15.82	15.82	16.36	16.36	9.02	45.48	**154.78**	8,456.2	896.1	8.5	211.12	**534.7**	-	99.4	1.57	9.73
HZ 880M B	15.89	15.89	16.36	16.36	9.06	50.45	**171.68**	9,296.3	956.5	11.1	226.72	**584.9**	-	105.6	1.58	9.74
HZ 880M C	15.97	15.97	16.36	16.36	9.06	52.69	**179.31**	9,873.3	994.5	13.1	237.43	**618.2**	-	109.8	1.58	9.74
HZ 1080M A	20.62	20.62	21.17	21.17	8.94	56.67	**192.84**	16,379.9	882.1	12.0	355.26	**794.4**	-	98.7	1.55	11.23
HZ 1080M B	20.74	20.74	21.17	21.17	8.94	60.18	**204.80**	17,899.8	947.0	15.1	384.36	**863.2**	-	106.0	1.56	11.23
HZ 1080M C	20.85	20.85	21.17	21.17	8.98	66.69	**226.96**	19,783.7	1,009.9	20.4	412.95	**948.7**	-	112.5	1.56	11.23
HZ 1080M D	21.01	21.01	21.17	21.17	9.00	71.96	**244.90**	21,619.1	1,057.2	26.5	436.79	**1,028.9**	-	117.5	1.56	11.24
HZ 1180M A	21.17	21.17	21.17	21.17	9.02	76.17	**259.23**	23,001.4	1,080.6	32.0	450.16	**1,086.6**	-	119.9	1.57	11.24
HZ 1180M B	21.25	21.25	21.25	21.25	9.02	78.66	**267.68**	24,117.8	1,134.2	36.3	474.70	**1,135.1**	-	125.8	1.58	11.28
HZ 1180M C	21.33	21.33	21.33	21.33	9.04	83.17	**283.06**	25,654.4	1,219.6	42.8	512.31	**1,202.9**	-	135.0	1.58	11.31
HZ 1180M D	21.41	21.41	21.41	21.41	9.06	86.96	**295.94**	26,870.5	1,257.5	49.1	530.71	**1,255.3**	-	138.9	1.60	11.31

Solution 124



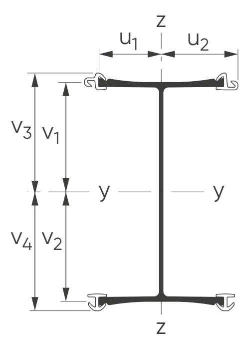
Section	Dimensions					Properties per solution										
	v_1	v_2	v_3	u_1	u_2	A	G	I_y	I_z	I_t	I_ω	$W_{el,y}$ *	$W_{el,y}$ **	$W_{el,z}$	A_{LW}	A_{LS}
	in	in	in	in	in	in^2	lb/ft	in^4	in^4	in^4	10^3in^6	in^3	in^3	in^3	ft^2/ft	ft^2/ft
HZ 630M	10.71	13.53	11.82	8.26	10.39	53.66	**182.62**	5,937.2	1253.8	16.9	142.72	**438.9**	502.2	120.7	1.91	8.35
HZ 880M A	13.87	17.76	15.23	9.01	11.14	51.85	**176.46**	9,853.3	1472.7	12.1	295.46	**554.9**	647.1	132.2	2.04	9.90
HZ 880M B	14.12	17.66	15.40	9.05	11.18	56.82	**193.36**	10,710.5	1537.8	14.8	314.31	**606.3**	695.7	137.6	2.05	9.91
HZ 880M C	14.27	17.68	15.46	9.05	11.18	59.06	**201.00**	11,294.3	1575.8	16.7	327.00	**639.0**	730.4	141.0	2.05	9.91
HZ 1080M A	18.54	22.70	19.89	8.93	11.06	63.04	**214.53**	18,812.5	1449.2	15.7	497.11	**828.7**	946.0	131.1	2.02	11.39
HZ 1080M B	18.76	22.71	20.00	8.93	11.06	66.55	**226.49**	20,346.7	1514.1	18.8	531.53	**896.0**	1,017.5	136.9	2.03	11.40
HZ 1080M C	19.06	22.65	20.17	8.97	11.10	73.06	**248.65**	22,253.8	1581.7	24.0	565.69	**982.5**	1,103.2	142.5	2.03	11.40
HZ 1080M D	19.34	22.69	20.29	8.99	11.12	78.33	**266.58**	24,105.0	1631.4	30.1	593.94	**1,062.5**	1,187.8	146.8	2.03	11.41
HZ 1180M A	19.58	22.76	20.38	9.01	11.14	82.55	**280.92**	25,498.5	1657.2	35.9	610.14	**1,120.4**	1,251.2	148.8	2.04	11.41
HZ 1180M B	19.70	22.79	20.43	9.01	11.14	85.03	**289.36**	26,621.0	1710.7	40.3	638.26	**1,168.0**	1,303.4	153.6	2.04	11.43
HZ 1180M C	19.72	22.94	20.48	9.03	11.16	90.24	**307.11**	28,409.7	1849.7	48.6	693.27	**1,238.6**	1,387.4	165.8	2.08	11.46
HZ 1180M D	19.86	22.95	20.54	9.05	11.18	94.03	**319.99**	29,635.2	1890.2	55.0	715.10	**1,291.3**	1,442.7	169.1	2.10	11.47

Solution 12



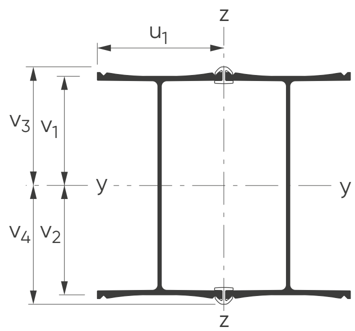
Section	Dimensions					Properties per solution										
	v_1	v_2	v_3	u_1	u_2	A	G	I_y	I_z	I_t	I_ω	$W_{el,y}$ *	$W_{el,y}$ **	$W_{el,z}$	A_{LW}	A_{LS}
	in	in	in	in	in	in^2	lb/ft	in^4	in^4	in^4	10^3in^6	in^3	in^3	in^3	ft^2/ft	ft^2/ft
HZ 630M	10.85	13.39	11.96	8.26	10.39	54.20	**184.45**	6036.6	1,282.9	17.4	149.91	**450.7**	504.8	123.5	1.91	8.29
HZ 880M A	14.04	17.59	15.40	9.01	11.14	52.35	**178.14**	10,013.4	1,505.2	12.6	309.68	**569.4**	650.4	135.1	2.04	9.84
HZ 880M B	14.29	17.50	15.56	9.05	11.18	57.36	**195.19**	10,882.4	1,573.5	15.4	329.75	**622.0**	699.2	140.8	2.05	9.85
HZ 880M C	14.43	17.52	15.62	9.05	11.18	59.60	**202.83**	11,464.9	1,611.4	17.3	342.37	**654.6**	733.8	144.2	2.05	9.85
HZ 1080M A	18.72	22.51	20.07	8.93	11.06	63.52	**216.17**	19,067.5	1,480.5	16.2	520.72	**846.9**	949.9	133.9	2.02	11.34
HZ 1080M B	18.96	22.51	20.19	8.93	11.06	67.09	**228.32**	20,628.1	1,548.7	19.4	557.26	**916.2**	1,021.7	140.1	2.03	11.33
HZ 1080M C	19.23	22.48	20.35	8.97	11.10	73.60	**250.48**	22,531.1	1,616.7	24.6	591.43	**1,002.5**	1,107.3	145.7	2.03	11.34
HZ 1080M D	19.50	22.53	20.46	8.99	11.12	78.87	**268.41**	24,379.5	1,666.5	30.7	619.71	**1,082.3**	1,191.9	149.9	2.03	11.34
HZ 1180M A	19.73	22.61	20.53	9.01	11.14	83.09	**282.76**	25,773.1	1,692.8	36.6	636.33	**1,140.1**	1,255.2	152.0	2.04	11.34
HZ 1180M B	19.89	22.60	20.61	9.01	11.14	85.75	**291.81**	26,985.0	1,758.2	41.3	672.36	**1,193.9**	1,309.0	157.9	2.04	11.36
HZ 1180M C	19.90	22.76	20.66	9.03	11.16	90.96	**309.55**	28,778.5	1,897.2	49.7	728.05	**1,264.6**	1,393.2	170.1	2.08	11.39
HZ 1180M D	20.13	22.68	20.81	9.05	11.18	95.12	**323.70**	30,194.1	1,962.2	56.7	766.85	**1,331.1**	1,451.1	175.6	2.10	11.40

Solution 14



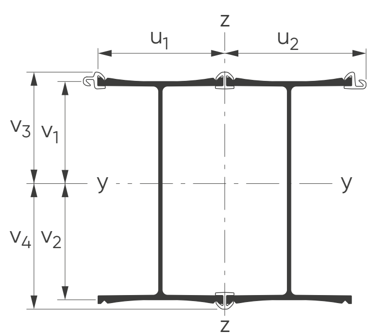
Section	Dimensions						Properties per solution										
	v_1	v_2	v_3	v_4	u_1	u_2	A	G	I_y	I_z	I_t	I_ω	$W_{el,y}$ *	$W_{el,y}$ **	$W_{el,z}$	A_{LW}	A_{LS}
	in	in	in	in	in	in	in^2	lb/ft	in^4	in^4	in^4	10^3in^6	in^3	in^3	in^3	ft^2/ft	ft^2/ft
HZ 630M	12.10	12.14	13.22	13.25	8.26	10.39	59.90	**203.85**	6,939.7	1,711.8	20.8	232.59	**571.8**	523.7	164.8	1.91	9.21
HZ 880M A	15.79	15.84	17.14	17.20	9.01	11.14	58.09	**197.70**	11,628.6	2,013.9	15.8	481.45	**734.1**	676.2	180.8	2.04	10.62
HZ 880M B	15.87	15.92	17.14	17.19	9.05	11.18	63.06	**214.59**	12,468.7	2,083.6	18.4	501.51	**783.4**	725.1	186.4	2.05	10.63
HZ 880M C	15.95	15.99	17.14	17.19	9.05	11.18	65.30	**222.23**	13,045.7	2,121.5	20.4	514.37	**815.6**	758.7	189.8	2.05	10.63
HZ 1080M A	20.59	20.65	21.94	22.00	8.93	11.06	69.28	**235.76**	21,761.8	1,981.3	19.2	810.63	**1,053.9**	989.0	179.2	2.02	12.11
HZ 1080M B	20.71	20.77	21.94	22.00	8.93	11.06	72.79	**247.72**	23,281.5	2,046.2	22.4	844.03	**1,121.2**	1,058.2	185.0	2.03	12.11
HZ 1080M C	20.83	20.88	21.94	22.00	8.97	11.10	79.30	**269.88**	25,165.6	2,118.4	27.6	880.41	**1,205.2**	1,143.9	190.9	2.03	12.12
HZ 1080M D	20.99	21.04	21.94	22.00	8.99	11.12	84.57	**287.81**	27,001.0	2,170.3	33.7	910.54	**1,283.5**	1,227.4	195.2	2.03	12.12
HZ 1180M A	21.15	21.19	21.94	21.97	9.01	11.14	88.78	**302.15**	28,383.2	2,198.4	39.6	929.19	**1,339.3**	1,291.7	197.4	2.04	12.12
HZ 1180M B	21.22	21.27	21.95	22.00	9.01	11.14	91.27	**310.60**	29,499.6	2,251.9	44.0	957.17	**1,386.8**	1,341.1	202.2	2.04	12.13
HZ 1180M C	21.49	21.16	22.25	21.92	9.03	11.16	98.07	**333.73**	31,982.3	2,538.0	54.7	1,088.07	**1,488.0**	1,437.2	227.5	2.08	12.24
HZ 1180M D	21.57	21.25	22.25	21.93	9.05	11.18	101.85	**346.61**	33,198.4	2,581.4	60.9	1,111.46	**1,539.4**	1,492.3	231.0	2.10	12.26

Solution 22



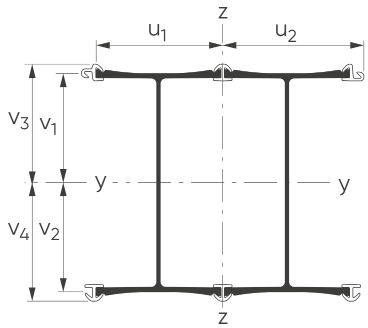
Section	Dimensions						Properties per solution										
	v_1	v_2	v_3	v_4	u_1	u_2	A	G	I_y	I_z	I_t	I_ω	$W_{el,y}$ *	$W_{el,y}$ **	$W_{el,z}$	A_{LW}	A_{LS}
	in	in	in	in	in	in	in²	lb/ft	in⁴	in⁴	in⁴	10³in⁶	in³	in³	in³	ft²/ft	ft²/ft
HZ 630M	12.12	12.12	13.24	13.24	16.81	16.81	100.82	**343.10**	11,185.2	8,433.8	5,736.1	261.7	**922.8**	845.1	501.7	3.0	9.63
HZ 880M A	15.82	15.82	17.17	17.17	18.31	18.31	97.20	**330.79**	18,492.4	9,647.5	7,951.3	674.4	**1,169.3**	1,076.9	527.0	3.3	11.45
HZ 880M B	15.89	15.89	17.17	17.17	18.39	18.39	107.13	**364.59**	20,172.7	10,699.5	9,097.2	690.2	**1,269.2**	1,174.8	581.9	3.3	11.47
HZ 880M C	15.97	15.97	17.17	17.17	18.39	18.39	111.62	**379.85**	21,326.7	11,166.0	9,306.5	777.9	**1,335.2**	1,242.0	607.3	3.3	11.47
HZ 1080M A	20.62	20.62	21.97	21.97	18.15	18.15	119.57	**406.92**	35,436.0	11,385.5	12,938.6	1,383.9	**1,718.7**	1,612.7	627.3	3.3	12.93
HZ 1080M B	20.74	20.74	21.97	21.97	18.15	18.15	126.60	**430.84**	38,475.7	12,111.6	13,334.4	1,639.4	**1,855.5**	1,751.0	667.3	3.3	12.94
HZ 1080M C	20.85	20.85	21.97	21.97	18.23	18.23	139.62	**475.16**	42,243.6	13,439.8	15,036.9	1,746.3	**2,025.7**	1,922.5	737.3	3.3	12.95
HZ 1080M D	21.01	21.01	21.97	21.97	18.27	18.27	150.16	**511.03**	45,914.4	14,489.0	16,098.5	1,926.9	**2,185.2**	2,089.6	793.2	3.3	12.95
HZ 1180M A	21.17	21.17	21.97	21.97	18.31	18.31	158.59	**539.70**	48,678.9	15,315.8	17,044.0	2,013.7	**2,299.5**	2,215.4	836.6	3.3	12.96
HZ 1180M B	21.25	21.25	21.97	21.97	18.31	18.31	163.55	**556.59**	50,911.8	15,851.4	16,725.7	2,206.6	**2,396.1**	2,317.0	865.9	3.3	13.00
HZ 1180M C	21.33	21.33	22.09	22.09	18.39	18.39	174.17	**592.74**	54,650.4	16,987.3	17,908.5	2,432.6	**2,562.5**	2,474.4	923.9	3.3	13.04
HZ 1180M D	21.41	21.41	22.09	22.09	18.43	18.43	181.74	**618.50**	57,082.5	17,788.8	18,787.2	2,505.1	**2,666.7**	2,584.5	965.5	3.4	13.07

Solution 24



Section	Dimensions						Properties per solution										
	v_1	v_2	v_3	v_4	u_1	u_2	A	G	I_y	I_z	I_t	I_ω	$W_{el,y}$ *	$W_{el,y}$ **	$W_{el,z}$	A_{LW}	A_{LS}
	in	in	in	in	in	in	in²	lb/ft	in⁴	in⁴	in⁴	10³in⁶	in³	in³	in³	ft²/ft	ft²/ft
HZ 630M	11.42	12.83	12.53	13.94	16.81	18.93	107.19	**364.79**	1,2031.0	10,338.8	6,085.9	354.57	**938.1**	863.0	546.1	3.50	9.94
HZ 880M A	14.84	16.79	16.20	18.14	18.30	20.43	103.57	**352.48**	1,9987.0	11,896.0	7,954.0	896.15	**1,190.7**	1101.7	582.3	3.75	11.62
HZ 880M B	15.01	16.78	16.28	18.06	18.38	20.51	113.50	**386.27**	2,1675.8	12,966.9	9,090.4	911.30	**1,291.8**	1,200.4	632.3	3.77	11.64
HZ 880M C	15.12	16.83	16.32	18.02	18.38	20.51	117.99	**401.54**	2,2833.2	13,433.4	9,423.6	1,011.65	**1,357.1**	1,266.8	655.1	3.77	11.64
HZ 1080M A	19.58	21.66	20.93	23.02	18.14	20.27	125.94	**428.61**	38,005.0	13,596.5	12,952.5	1,801.03	**1,754.6**	1,651.3	670.7	3.73	13.10
HZ 1080M B	19.75	21.72	20.99	22.96	18.14	20.27	132.97	**452.52**	41,051.9	14,322.7	13,338.5	2,088.54	**1,889.8**	1,788.0	706.6	3.73	13.11
HZ 1080M C	19.96	21.75	21.07	22.87	18.22	20.35	145.99	**496.84**	44,831.4	15,669.5	15,038.3	2,203.45	**2,060.9**	1,960.1	770.1	3.74	13.12
HZ 1080M D	20.17	21.85	21.14	22.81	18.26	20.39	156.53	**532.71**	48,510.1	16,728.2	16,112.1	2,401.67	**2,220.2**	2,126.6	820.5	3.75	13.12
HZ 1180M A	20.37	21.97	21.18	22.77	18.30	20.43	164.96	**561.38**	51,280.2	17,564.3	17,239.8	2,496.73	**2,334.7**	2,252.2	859.9	3.75	13.13
HZ 1180M B	20.48	22.02	21.20	22.75	18.30	20.43	169.92	**578.28**	53,516.1	18,099.9	17,283.1	2,704.22	**2,430.4**	2,352.8	886.1	3.76	13.15
HZ 1180M C	20.53	22.13	21.29	22.89	18.38	20.51	181.24	**616.79**	57,523.0	19,477.8	17,911.7	2,999.37	**2,599.6**	2,513.3	949.8	3.82	13.20
HZ 1180M D	20.64	22.17	21.32	22.86	18.42	20.55	188.81	**642.55**	59,959.8	20,289.8	18,834.4	3,085.94	**2,704.0**	2,623.4	987.5	3.86	13.23

Solution 26

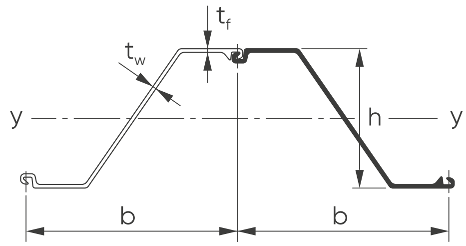


Section	Dimensions						Properties per solution									
	v_1	v_2	v_3	v_4	u_1	u_2	A	G	I_y	I_z	I_t	I_ω	$W_{el,y}$ *	$W_{el,y}$ **	$W_{el,z}$	A_{LW}	A_{LS}
	in	in	in	in	in	in	in²	lb/ft	in⁴	in⁴	in⁴	10³in⁶	in³	in³	in³	ft²/ft	ft²/ft
HZ 630M	12.11	12.13	13.23	13.24	16.81	18.93	113.43	**386.02**	12,980.3	12,162.8	6,089.5	483.05	**1,070.2**	980.1	642.4	3.50	10.80
HZ 880M A	15.80	15.83	17.16	17.19	18.30	20.43	109.81	**373.71**	21,664.8	14,052.9	7,957.9	1,208.37	**1,368.7**	1,260.7	687.9	3.75	12.33
HZ 880M B	15.88	15.91	17.16	17.18	18.38	20.51	119.74	**407.50**	23,345.0	15,142.1	9,095.8	1,212.94	**1,467.7**	1,358.6	738.4	3.77	12.35
HZ 880M C	15.96	15.98	17.16	17.18	18.38	20.51	124.23	**422.77**	24,499.0	15,608.6	9,425.1	1,327.70	**1,532.7**	1,425.6	761.1	3.77	12.35
HZ 1080M A	20.60	20.63	21.96	21.99	18.14	20.27	132.18	**449.84**	40,817.8	15,717.1	13,097.6	2,360.70	**1,978.2**	1,859.0	775.4	3.73	13.81
HZ 1080M B	20.72	20.75	21.96	21.99	18.14	20.27	139.21	**473.75**	43,857.5	16,443.3	13,341.1	2,680.63	**2,113.5**	1,997.4	811.2	3.73	13.82
HZ 1080M C	20.84	20.87	21.96	21.99	18.22	20.35	152.23	**518.07**	47,625.5	17,808.3	15,043.2	2,790.03	**2,282.2**	2,168.8	875.2	3.74	13.83
HZ 1080M D	21.00	21.02	21.96	21.99	18.26	20.39	162.77	**553.94**	51,296.2	18,876.0	16,112.6	3,000.12	**2,439.8**	2,335.9	925.9	3.75	13.83
HZ 1180M A	21.16	21.18	21.96	21.99	18.30	20.43	171.20	**582.61**	54,060.7	19,721.2	17,208.1	3,094.22	**2,552.3**	2,461.7	965.4	3.75	13.84
HZ 1180M B	21.24	21.26	21.96	21.99	18.30	20.43	176.16	**599.51**	56,293.6	20,256.9	17,287.4	3,320.98	**2,647.9**	2,563.3	991.7	3.76	13.85
HZ 1180M C	21.41	21.24	22.17	22.00	18.38	20.51	189.07	**643.42**	60,979.6	22,216.2	17,941.7	3,808.09	**2,847.8**	2,750.2	1,083.4	3.82	13.97
HZ 1180M D	21.49	21.32	22.17	22.00	18.42	20.55	196.63	**669.18**	63,411.7	23,041.8	18,829.7	3,881.75	**2,951.0**	2,860.4	1,121.5	3.86	14.01

Note: Alternative solutions are available on request.

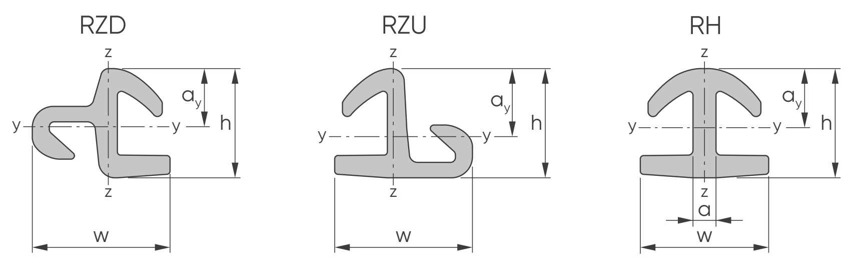
Combined wall, combination 24

AZ® - Intermediary piles



Section	Dimensions				Properties per double pile					
	h	b	t_f	t_w	A	G	I_y	$W_{el,y}$	i_y	A_{LW}
	in	in	in	in	in²	lb/ft	in⁴	in³	in	ft²/ft
AZ 20-800	17.72	31.50	0.375	0.375	34.97	119.01	1731.5	195.6	7.04	6.82
AZ 20-800-10/10	17.74	31.50	0.394	0.394	36.52	124.27	1,803.6	203.5	7.03	6.82
AZ 25-800	18.70	31.50	0.492	0.394	40.50	137.82	2,283.8	244.4	7.51	6.94
AZ 13-770	13.54	30.32	0.354	0.354	30.04	102.23	827.4	122.0	5.25	6.05
AZ 14-770-10/10	13.58	30.32	0.394	0.394	32.74	111.41	896.9	132.1	5.23	6.05
AZ 28-750	20.04	29.53	0.472	0.394	39.80	135.46	2,578.1	257.2	8.05	6.93
AZ 30-750	20.08	29.53	0.512	0.433	42.95	146.17	2,762.9	275.2	8.02	6.93
AZ 32-750	20.12	29.53	0.551	0.472	46.10	156.88	2,948.1	293.2	8.00	6.93
AZ 13-700	12.40	27.56	0.375	0.375	29.22	99.45	690.7	111.4	4.86	5.61
AZ 13-700-10/10	12.42	27.56	0.394	0.394	30.47	103.71	718.6	115.6	4.86	5.61
AZ 18-700	16.54	27.56	0.354	0.354	30.21	102.81	1271.4	153.8	6.48	6.10
AZ 20-700	16.57	27.56	0.394	0.394	32.98	112.22	1377.6	166.3	6.46	6.10
AZ 26-700	18.11	27.56	0.480	0.480	40.62	138.24	2,008.7	221.8	7.03	6.33
AZ 18-10/10	15.00	24.80	0.394	0.394	30.72	104.55	1076.1	143.7	5.92	5.61
AZ 26	16.81	24.80	0.512	0.480	38.63	131.45	1680.3	199.9	6.60	5.84

Connectors



Section	Dimensions				Properties							
	h	w	a	a_y	A	G	I_y	I_z	$W_{el,y}$	$W_{el,z}$	A_{LW}	A_{LS}
	in	in	in	in	in²	lb/ft	in⁴	in⁴	in³	in³	ft²/ft	ft²/ft
RZD 16	2.43	3.19	-	1.24	3.21	**10.89**	1.4	2.3	**1.1**	1.3	0.39	0.20
RZU 16	2.43	3.19	-	1.51	3.16	**10.82**	1.6	2.3	**1.1**	1.3	0.26	0.33
RH 16	2.43	2.69	0.48	1.28	3.12	**10.62**	2.0	1.3	**1.5**	1.0	0.33	0.30
RZD 18	2.65	3.35	-	1.41	3.57	**12.16**	1.9	2.6	**1.3**	1.5	0.39	0.23
RZU 18	2.65	3.35	-	1.66	3.50	**12.03**	2.2	2.6	**1.3**	1.5	0.30	0.33
RH 20	2.65	3.12	0.56	1.44	3.91	**13.31**	3.0	2.1	**2.0**	1.3	0.36	0.33

Note: For suitable combinations of connectors and HZ®-M king piles, see page 4.

Delivery conditions

Tolerances

Standard EN 10248-2	HZ®-M	AZ®
Mass[1]	± 5 %	± 5 %
Length (L)	± 7.87 in	± 7.87 in
Thicknesses (t_f,t_w)	t_f,t_w > 0.49 in: + 0.10 in / - 0.06 in	t_f,t_w > 0.33 in: ± 6 %
Height (h)	h ≥ 19.69 in: ± 0.28 in	h ≥ 11.8 in: ± 0.28 in
Width single pile	± 2 % w	± 2 % b
Width double piles	–	± 3 % (2b)
Straightness (q)	≤ 0.2 % L	≤ 0.2 % L
Ends out of square	± 2 % w	± 2 % b

[1] From the mass of the total delivery.

Maximum rolling length[2]

HZ	108.3 ft
AZ	101.7 ft
RZD / RZU / RH	78.7 ft

[2] Longer sections may be supplied. Please contact us.

Section / Steel grade	EN 10248-1							ASTM	
	S 240 GP	S 270 GP	S 320 GP	S 355 GP	S 390 GP	S 430 GP	S 460 GP	A 572	A 690
HZ	✓ 3)	✓	✓	✓	✓	✓	✓	✓	✓
AZ	✓ 3)	✓	✓	✓	✓	✓	✓	✓	✓ 3)
RH / RZD / RZU	×	×	×	×	×	✓	✓	×	✓

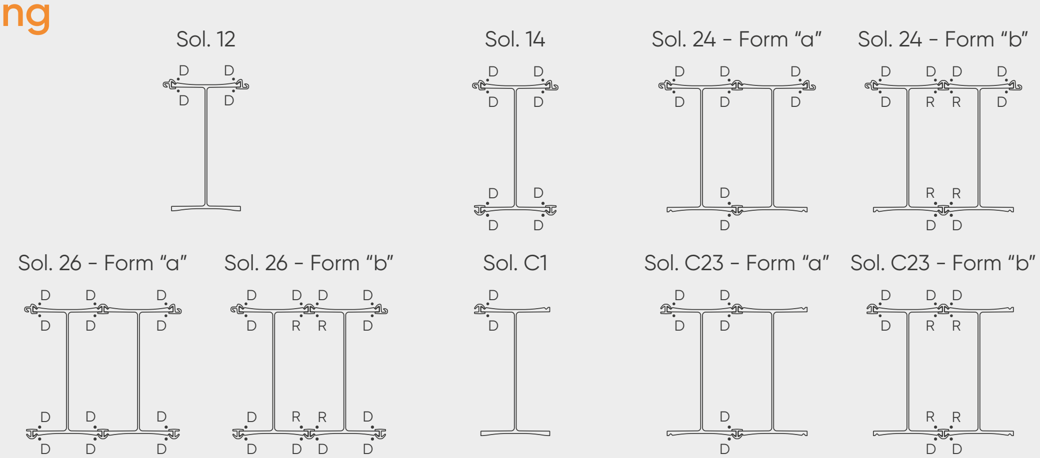
[3] Please contact us as some limitations may apply. ✓ available × currently unavailable

Steel grades

Standard EN 10248-1	Min. yield strength R_{eH}	Min. tensile strength R_m	Min. elongation $L_0 = 5.65 \sqrt{S_0}$	Minimum impact energy KV_2 Testing temperature	Minimum impact energy KV_2 Joules
	ksi	ksi	%	°C	J
S 240 GP	**34.8**	49.3	26	20	27
S 270 GP	**39.2**	59.5	24	20	27
S 320 GP	**46.4**	63.8	23	20	27
S 355 GP	**51.5**	69.6	22	0	27
S 390 GP	**56.6**	71.1	20	0	27
S 430 GP	**62.4**	74.0	19	0	27
S 460 GP	**66.7**	76.9	17	0	27

Contact us for enquiries on S 500 GP steel grade.
All the components of the HZ-M Steel Wall System are available in **ASTM A 690** steel grade. **ASTM A 690** with higher yield strength on request.

Standard welding configuration



D discontinuous weld, a = 0.24 in: 10% of length (1.20 in/ft) over whole connector length and 19.69 in continuous weld at top and toe of connector

R continuous weld, a = 0.24 in: 19.69 in at the top and toe of connector

In **Form "a"** the HZ-M king piles can be driven separately if necessary (for instance, in hard driving conditions).

Form "b" is the standard delivery form: the HZ-M king piles are welded together and can only be driven in one piece as a box pile. If hard driving conditions are predicted, the length of the discontinuous weld "D" should be increased.
Please contact our technical department for more details.

Section	Properties per foot of wall[1]							Per system		
	A	I_y	$W_{el.y}$ *	$W_{el.y}$ **	$G_{60\%}$	$G_{80\%}$	$G_{100\%}$	A_{LW}	A_{LS}	b_{sys}
	in²/ft	in⁴/ft	in³/ft	in³/ft	lb/ft²	lb/ft²	lb/ft²	ft²/ft	ft²/ft	in

Combination HZ ... M - 12 / AZ 20-800

Section	A	I_y	$W_{el.y}$ *	$W_{el.y}$ **	$G_{60\%}$	$G_{80\%}$	$G_{100\%}$	A_{LW}	A_{LS}	b_{sys}
HZ 630M	13.00	1,132.9	84.6	94.7	36.05	40.15	44.25	8.73	15.11	82.28
HZ 880M A	12.51	1,682.3	95.7	109.3	34.50	38.53	42.56	8.86	16.67	83.74
HZ 880M B	13.21	1,805.1	103.2	116.0	36.91	40.93	44.96	8.87	16.67	83.74
HZ 880M C	13.53	1,888.4	107.8	120.9	38.00	42.03	46.05	8.87	16.67	83.74
HZ 1080M A	14.13	2,984.8	132.6	148.7	40.02	44.06	48.10	8.84	18.16	83.74
HZ 1080M B	14.65	3,208.7	142.5	158.9	41.77	45.80	49.84	8.85	18.16	83.74
HZ 1080M C	15.57	3,478.6	154.8	171.0	44.90	48.94	52.97	8.85	18.16	83.74
HZ 1080M D	16.31	3,741.8	166.1	182.9	47.45	51.48	55.52	8.86	18.16	83.74
HZ 1180M A	16.91	3,939.7	174.3	191.9	49.49	53.52	57.55	8.86	18.17	83.74
HZ 1180M B	17.29	4,113.2	182.0	199.5	50.78	54.81	58.84	8.86	18.18	83.74
HZ 1180M C	18.03	4,368.1	191.9	211.5	53.16	57.26	61.35	8.91	18.21	83.74
HZ 1180M D	18.62	4,568.6	201.4	219.6	55.16	59.26	63.35	8.93	18.23	83.74

Combination HZ ... M - 14 / AZ 20-800

Section	A	I_y	$W_{el.y}$ *	$W_{el.y}$ **	$G_{60\%}$	$G_{80\%}$	$G_{100\%}$	A_{LW}	A_{LS}	b_{sys}
HZ 630M	13.84	1,264.6	104.2	95.4	37.64	42.36	47.08	8.73	16.03	82.28
HZ 880M A	13.33	1,913.7	120.8	111.3	36.08	40.72	45.36	8.86	17.44	83.74
HZ 880M B	14.03	2,032.1	127.7	118.2	38.47	43.10	47.74	8.87	17.45	83.74
HZ 880M C	14.35	2,114.6	132.2	123.0	39.56	44.20	48.83	8.87	17.45	83.74
HZ 1080M A	14.96	3,371.4	163.3	153.2	41.62	46.26	50.91	8.84	18.93	83.74
HZ 1080M B	15.46	3,589.5	172.9	163.1	43.33	47.98	52.63	8.85	18.93	83.74
HZ 1080M C	16.38	3,856.3	184.7	175.3	46.47	51.11	55.75	8.85	18.94	83.74
HZ 1080M D	17.13	4,117.5	195.7	187.2	49.02	53.66	58.30	8.86	18.94	83.74
HZ 1180M A	17.73	4,313.5	203.5	196.3	51.05	55.68	60.32	8.86	18.94	83.74
HZ 1180M B	18.08	4,473.4	210.3	203.4	52.26	56.89	61.53	8.86	18.95	83.74
HZ 1180M C	19.05	4,826.8	224.6	216.9	55.10	59.96	64.82	8.91	19.06	83.74
HZ 1180M D	19.58	4,998.5	231.8	224.7	56.92	61.77	66.63	8.93	19.08	83.74

Combination HZ ... M - 24 / AZ 20-800

Section	A	I_y	$W_{el.y}$ *	$W_{el.y}$ **	$G_{60\%}$	$G_{80\%}$	$G_{100\%}$	A_{LW}	A_{LS}	b_{sys}
HZ 630M	17.17	1,662.0	129.6	119.2	51.63	55.02	58.42	10.32	16.77	99.37
HZ 880M A	16.24	2,546.1	151.7	140.3	48.67	51.97	55.27	10.58	18.44	102.28
HZ 880M B	17.38	2,739.9	163.3	151.7	52.56	55.85	59.14	10.60	18.46	102.28
HZ 880M C	17.90	2,875.4	170.9	159.5	54.34	57.64	60.93	10.59	18.46	102.28
HZ 1080M A	18.92	4,672.8	215.7	203.0	57.78	61.09	64.39	10.55	19.92	102.28
HZ 1080M B	19.75	5,031.1	231.6	219.1	60.59	63.90	67.21	10.56	19.93	102.28
HZ 1080M C	21.25	5,467.1	251.3	239.0	65.70	69.00	72.31	10.57	19.94	102.28
HZ 1080M D	22.47	5,894.5	269.8	258.4	69.86	73.16	76.46	10.57	19.94	102.28
HZ 1180M A	23.44	6,214.8	282.9	272.9	73.16	76.46	79.76	10.57	19.95	102.28
HZ 1180M B	24.02	6,476.9	294.1	284.7	75.15	78.44	81.74	10.59	19.98	102.28
HZ 1180M C	25.31	6,936.0	313.4	303.0	79.43	82.78	86.13	10.64	20.02	102.28
HZ 1180M D	26.17	7,215.6	325.4	315.7	82.38	85.73	89.07	10.68	20.05	102.28

Combination HZ ... M - 26 / AZ 20-800

Section	A	I_y	$W_{el.y}$ *	$W_{el.y}$ **	$G_{60\%}$	$G_{80\%}$	$G_{100\%}$	A_{LW}	A_{LS}	b_{sys}
HZ 630M	17.92	1,776.7	146.5	134.1	53.17	57.08	60.99	10.32	17.62	99.37
HZ 880M A	16.97	2,742.8	173.3	159.6	50.17	53.96	57.76	10.58	19.16	102.28
HZ 880M B	18.11	2,935.3	184.5	170.8	54.05	57.84	61.63	10.60	19.18	102.28
HZ 880M C	18.63	3,070.4	192.1	178.7	55.83	59.62	63.41	10.59	19.17	102.28
HZ 1080M A	19.66	5,003.6	242.5	227.5	59.27	63.08	66.89	10.55	20.63	102.28
HZ 1080M B	20.48	5,361.1	258.3	243.8	62.09	65.90	69.70	10.56	20.64	102.28
HZ 1080M C	21.98	5,795.2	277.7	263.6	67.20	71.00	74.80	10.57	20.65	102.28
HZ 1080M D	23.20	6,221.4	295.9	283.0	71.35	75.15	78.95	10.57	20.65	102.28
HZ 1180M A	24.17	6,540.7	308.8	297.5	74.66	78.45	82.25	10.57	20.66	102.28
HZ 1180M B	24.75	6,802.5	320.0	309.4	76.64	80.43	84.23	10.59	20.67	102.28
HZ 1180M C	26.22	7,340.6	342.8	331.1	81.30	85.27	89.24	10.64	20.79	102.28
HZ 1180M D	27.09	7,619.4	354.6	343.7	84.25	88.22	92.19	10.68	20.83	102.28

[1] Values taking the intermediary sheet piles into account.

Section	A	I_y	$W_{el.y}$ *	$W_{el.y}$ **	$G_{60\%}$	$G_{80\%}$	$G_{100\%}$	A_{LW}	A_{LS}	b_{sys}
	Properties per foot of wall[1]							Per system		
	in²/ft	in⁴/ft	in³/ft	in³/ft	lb/ft²	lb/ft²	lb/ft²	ft²/ft	ft²/ft	in
Combination HZ ... M - 12 / AZ 20-800-10/10										
HZ 630M	13.23	1,143.4	**85.4**	95.6	36.51	40.77	**45.02**	8.73	15.12	82.28
HZ 880M A	12.73	1,692.6	**96.3**	109.9	34.95	39.13	**43.32**	8.86	16.67	83.74
HZ 880M B	13.43	1,815.4	**103.8**	116.6	37.36	41.54	**45.72**	8.87	16.67	83.74
HZ 880M C	13.75	1,898.7	**108.4**	121.5	38.45	42.63	**46.81**	8.87	16.67	83.74
HZ 1080M A	14.36	2,995.1	**133.0**	149.2	40.48	44.67	**48.86**	8.85	18.16	83.74
HZ 1080M B	14.87	3,219.1	**143.0**	159.4	42.22	46.41	**50.60**	8.85	18.16	83.74
HZ 1080M C	15.79	3,488.9	**155.2**	171.5	45.36	49.54	**53.73**	8.86	18.16	83.74
HZ 1080M D	16.54	3,752.1	**166.6**	183.4	47.91	52.09	**56.27**	8.86	18.17	83.74
HZ 1180M A	17.13	3,950.0	**174.7**	192.4	49.94	54.12	**58.30**	8.86	18.17	83.74
HZ 1180M B	17.51	4,123.6	**182.4**	200.0	51.23	55.42	**59.60**	8.87	18.18	83.74
HZ 1180M C	18.25	4,378.4	**192.4**	212.0	53.62	57.86	**62.11**	8.91	18.21	83.74
HZ 1180M D	18.84	4,578.9	**201.9**	220.0	55.62	59.86	**64.11**	8.93	18.23	83.74
Combination HZ ... M - 14 / AZ 20-800-10/10										
HZ 630M	14.06	1,275.1	**105.1**	96.2	38.10	42.98	**47.85**	8.73	16.04	82.28
HZ 880M A	13.55	1,924.0	**121.5**	111.9	36.54	41.33	**46.12**	8.86	17.44	83.74
HZ 880M B	14.25	2,042.4	**128.3**	118.8	38.92	43.71	**48.49**	8.87	17.45	83.74
HZ 880M C	14.57	2,125.0	**132.8**	123.6	40.01	44.80	**49.58**	8.87	17.45	83.74
HZ 1080M A	15.18	3,381.8	**163.8**	153.7	42.07	46.87	**51.67**	8.85	18.93	83.74
HZ 1080M B	15.69	3,599.9	**173.4**	163.6	43.79	48.58	**53.38**	8.85	18.93	83.74
HZ 1080M C	16.60	3,866.6	**185.2**	175.8	46.92	51.72	**56.51**	8.86	18.94	83.74
HZ 1080M D	17.35	4,127.8	**196.2**	187.6	49.47	54.26	**59.05**	8.86	18.94	83.74
HZ 1180M A	17.95	4,323.8	**204.0**	196.8	51.50	56.29	**61.08**	8.86	18.94	83.74
HZ 1180M B	18.30	4,483.8	**210.8**	203.8	52.71	57.50	**62.29**	8.87	18.95	83.74
HZ 1180M C	19.27	4,837.1	**225.0**	217.4	55.55	60.56	**65.57**	8.91	19.06	83.74
HZ 1180M D	19.80	5,008.9	**232.3**	225.1	57.37	62.38	**67.38**	8.93	19.08	83.74
Combination HZ ... M - 24 / AZ 20-800-10/10										
HZ 630M	17.35	1,670.7	**130.3**	119.8	52.01	55.53	**59.06**	10.32	16.77	99.37
HZ 880M A	16.42	2,554.6	**152.2**	140.8	49.05	52.47	**55.89**	10.58	18.45	102.28
HZ 880M B	17.56	2,748.3	**163.8**	152.2	52.93	56.34	**59.76**	10.60	18.47	102.28
HZ 880M C	18.09	2,883.8	**171.4**	160.0	54.71	58.13	**61.55**	10.60	18.46	102.28
HZ 1080M A	19.10	4,681.3	**216.1**	203.4	58.15	61.58	**65.01**	10.55	19.92	102.28
HZ 1080M B	19.93	5,039.6	**232.0**	219.5	60.96	64.39	**67.83**	10.56	19.93	102.28
HZ 1080M C	21.43	5,475.6	**251.7**	239.4	66.07	69.50	**72.93**	10.57	19.94	102.28
HZ 1080M D	22.65	5,903.0	**270.2**	258.8	70.23	73.65	**77.08**	10.57	19.94	102.28
HZ 1180M A	23.62	6,223.2	**283.3**	273.3	73.54	76.96	**80.38**	10.58	19.95	102.28
HZ 1180M B	24.20	6,485.3	**294.5**	285.1	75.52	78.94	**82.36**	10.59	19.98	102.28
HZ 1180M C	25.49	6,944.4	**313.8**	303.4	79.80	83.27	**86.74**	10.64	20.02	102.28
HZ 1180M D	26.35	7,224.1	**325.8**	316.1	82.75	86.22	**89.69**	10.68	20.05	102.28
Combination HZ ... M - 26 / AZ 20-800-10/10										
HZ 630M	18.11	1,785.4	**147.2**	134.8	53.55	57.59	**61.62**	10.32	17.63	99.37
HZ 880M A	17.15	2,751.3	**173.8**	160.1	50.54	54.46	**58.38**	10.58	19.16	102.28
HZ 880M B	18.29	2,943.7	**185.1**	171.3	54.42	58.33	**62.25**	10.60	19.18	102.28
HZ 880M C	18.82	3,078.8	**192.6**	179.2	56.20	60.12	**64.03**	10.60	19.18	102.28
HZ 1080M A	19.84	5,012.1	**242.9**	227.9	59.65	63.58	**67.51**	10.55	20.63	102.28
HZ 1080M B	20.66	5,369.5	**258.8**	244.2	62.46	66.39	**70.32**	10.56	20.64	102.28
HZ 1080M C	22.16	5,803.7	**278.1**	264.0	67.57	71.49	**75.42**	10.57	20.65	102.28
HZ 1080M D	23.38	6,229.9	**296.3**	283.3	71.72	75.65	**79.57**	10.57	20.66	102.28
HZ 1180M A	24.35	6,549.2	**309.2**	297.9	75.03	78.95	**82.87**	10.58	20.66	102.28
HZ 1180M B	24.93	6,810.9	**320.4**	309.8	77.01	80.93	**84.85**	10.59	20.67	102.28
HZ 1180M C	26.40	7,349.0	**343.2**	331.4	81.67	85.76	**89.86**	10.64	20.80	102.28
HZ 1180M D	27.27	7,627.8	**355.0**	344.1	84.62	88.71	**92.80**	10.68	20.84	102.28

[1] Values taking the intermediary sheet piles into account.

Section	Properties per foot of wall[1]							Per system		
	A	I_y	$W_{el.y}$ *	$W_{el.y}$ **	$G_{60\%}$	$G_{80\%}$	$G_{100\%}$	A_{LW}	A_{LS}	b_{sys}
	in²/ft	in⁴/ft	in³/ft	in³/ft	lb/ft²	lb/ft²	lb/ft²	ft²/ft	ft²/ft	in
Combination HZ ... M - 12 / AZ 25-800										
HZ 630M	13.81	1,213.5	90.6	101.5	37.70	42.35	47.00	8.84	15.23	82.28
HZ 880M A	13.30	1,761.4	100.2	114.4	36.12	40.69	45.26	8.97	16.78	83.74
HZ 880M B	14.00	1,884.1	107.7	121.1	38.52	43.09	47.66	8.98	16.79	83.74
HZ 880M C	14.32	1,967.5	112.3	125.9	39.62	44.18	48.75	8.98	16.78	83.74
HZ 1080M A	14.93	3,064.1	136.1	152.6	41.64	46.22	50.80	8.96	18.27	83.74
HZ 1080M B	15.44	3,288.0	146.0	162.8	43.39	47.97	52.54	8.96	18.27	83.74
HZ 1080M C	16.36	3,557.7	158.3	174.8	46.52	51.10	55.67	8.97	18.27	83.74
HZ 1080M D	17.11	3,821.0	169.6	186.8	49.07	53.64	58.21	8.97	18.28	83.74
HZ 1180M A	17.70	4,018.8	177.8	195.7	51.10	55.67	60.24	8.97	18.28	83.74
HZ 1180M B	18.08	4,192.4	185.5	203.4	52.40	56.97	61.54	8.98	18.29	83.74
HZ 1180M C	18.82	4,447.2	195.4	215.3	54.78	59.42	64.05	9.02	18.32	83.74
HZ 1180M D	19.41	4,647.7	204.9	223.4	56.78	61.41	66.05	9.04	18.34	83.74
Combination HZ ... M - 14 / AZ 25-800										
HZ 630M	14.64	1,345.2	110.8	101.5	39.29	44.56	49.83	8.84	16.15	82.28
HZ 880M A	14.12	1,992.8	125.8	115.9	37.70	42.88	48.06	8.97	17.55	83.74
HZ 880M B	14.82	2,111.1	132.6	122.8	40.09	45.26	50.43	8.98	17.56	83.74
HZ 880M C	15.14	2,193.7	137.1	127.6	41.18	46.35	51.52	8.98	17.56	83.74
HZ 1080M A	15.75	3,450.7	167.1	156.8	43.24	48.42	53.61	8.96	19.04	83.74
HZ 1080M B	16.26	3,668.8	176.7	166.7	44.95	50.14	55.33	8.96	19.05	83.74
HZ 1080M C	17.18	3,935.5	188.5	178.9	48.09	53.27	58.45	8.97	19.05	83.74
HZ 1080M D	17.92	4,196.6	199.5	190.8	50.63	55.81	61.00	8.97	19.05	83.74
HZ 1180M A	18.52	4,392.6	207.3	199.9	52.66	57.84	63.02	8.97	19.05	83.74
HZ 1180M B	18.87	4,552.5	214.0	207.0	53.87	59.05	64.23	8.98	19.06	83.74
HZ 1180M C	19.84	4,905.9	228.2	220.5	56.72	62.11	67.51	9.02	19.17	83.74
HZ 1180M D	20.37	5,077.6	235.4	228.2	58.53	63.93	69.32	9.04	19.19	83.74
Combination HZ ... M - 24 / AZ 25-800										
HZ 630M	17.84	1,728.7	134.8	124.0	52.99	56.84	60.70	10.43	16.88	99.37
HZ 880M A	16.89	2,610.9	155.5	143.9	50.00	53.74	57.48	10.69	18.56	102.28
HZ 880M B	18.03	2,804.6	167.1	155.3	53.88	57.61	61.35	10.71	18.58	102.28
HZ 880M C	18.55	2,940.0	174.7	163.1	55.67	59.40	63.13	10.71	18.57	102.28
HZ 1080M A	19.57	4,737.8	218.7	205.9	59.11	62.86	66.61	10.66	20.03	102.28
HZ 1080M B	20.40	5,096.1	234.6	221.9	61.92	65.67	69.42	10.67	20.04	102.28
HZ 1080M C	21.90	5,532.0	254.3	241.9	67.03	70.77	74.52	10.68	20.05	102.28
HZ 1080M D	23.12	5,959.3	272.7	261.2	71.18	74.93	78.67	10.68	20.05	102.28
HZ 1180M A	24.09	6,279.5	285.9	275.8	74.49	78.23	81.97	10.69	20.06	102.28
HZ 1180M B	24.67	6,541.6	297.1	287.6	76.47	80.21	83.95	10.70	20.09	102.28
HZ 1180M C	25.95	7,000.6	316.4	305.9	80.75	84.54	88.33	10.75	20.13	102.28
HZ 1180M D	26.82	7,280.2	328.3	318.5	83.70	87.49	91.27	10.79	20.16	102.28
Combination HZ ... M - 26 / AZ 25-800										
HZ 630M	18.59	1,843.4	152.0	139.2	54.53	58.90	63.26	10.43	17.74	99.37
HZ 880M A	17.62	2,807.6	177.4	163.4	51.49	55.73	59.97	10.69	19.27	102.28
HZ 880M B	18.76	2,999.9	188.6	174.6	55.37	59.60	63.83	10.71	19.29	102.28
HZ 880M C	19.28	3,135.0	196.1	182.4	57.16	61.39	65.62	10.71	19.29	102.28
HZ 1080M A	20.31	5,068.6	245.6	230.5	60.60	64.85	69.11	10.66	20.75	102.28
HZ 1080M B	21.13	5,426.0	261.5	246.8	63.42	67.67	71.92	10.67	20.75	102.28
HZ 1080M C	22.63	5,860.1	280.8	266.5	68.52	72.77	77.01	10.68	20.76	102.28
HZ 1080M D	23.85	6,286.2	299.0	285.9	72.68	76.92	81.16	10.68	20.77	102.28
HZ 1180M A	24.82	6,605.5	311.8	300.4	75.98	80.22	84.46	10.69	20.77	102.28
HZ 1180M B	25.40	6,867.2	323.0	312.4	77.96	82.20	86.44	10.70	20.78	102.28
HZ 1180M C	26.87	7,405.2	345.8	334.0	82.62	87.03	91.45	10.75	20.91	102.28
HZ 1180M D	27.74	7,684.0	357.6	346.6	85.57	89.98	94.39	10.79	20.95	102.28

[1] Values taking the intermediary sheet piles into account.

Section	Properties per foot of wall[1]							Per system		
	A	I_y	$W_{el.y}$ *	$W_{el.y}$ **	$G_{60\%}$	$G_{80\%}$	$G_{100\%}$	A_{LW}	A_{LS}	b_{sys}
	in²/ft	in⁴/ft	in³/ft	in³/ft	lb/ft²	lb/ft²	lb/ft²	ft²/ft	ft²/ft	in

Combination HZ ... M - 12 / AZ 13-770

Section	A	Iy	Wel.y*	Wel.y**	G60%	G80%	G100%	ALW	ALS	bsys
HZ 630M	12.65	1,030.6	77.0	86.2	35.60	39.32	43.04	7.96	14.34	79.92
HZ 880M A	12.14	1,597.9	90.9	103.8	34.02	37.67	41.32	8.09	15.90	81.38
HZ 880M B	12.87	1,724.3	98.5	110.8	36.50	40.14	43.79	8.10	15.90	81.38
HZ 880M C	13.20	1,810.1	103.3	115.8	37.62	41.27	44.92	8.10	15.90	81.38
HZ 1080M A	13.82	2,938.0	130.5	146.4	39.70	43.36	47.02	8.08	17.39	81.38
HZ 1080M B	14.34	3,168.5	140.7	156.9	41.49	45.15	48.81	8.08	17.39	81.38
HZ 1080M C	15.29	3,446.2	153.3	169.4	44.72	48.38	52.03	8.08	17.39	81.38
HZ 1080M D	16.06	3,717.1	165.0	181.7	47.35	51.00	54.65	8.09	17.39	81.38
HZ 1180M A	16.67	3,920.7	173.4	190.9	49.44	53.09	56.74	8.09	17.40	81.38
HZ 1180M B	17.07	4,099.3	181.4	198.8	50.77	54.42	58.08	8.09	17.41	81.38
HZ 1180M C	17.83	4,361.6	191.7	211.1	53.22	56.94	60.66	8.14	17.44	81.38
HZ 1180M D	18.43	4,567.9	201.4	219.5	55.28	59.00	62.72	8.16	17.46	81.38

Combination HZ ... M - 14 / AZ 13-770

Section	A	Iy	Wel.y*	Wel.y**	G60%	G80%	G100%	ALW	ALS	bsys
HZ 630M	13.50	1,166.2	96.1	88.0	37.24	41.60	45.96	7.96	15.27	79.92
HZ 880M A	12.99	1,835.9	115.9	106.8	35.65	39.93	44.21	8.09	16.67	81.38
HZ 880M B	13.71	1,957.9	123.0	113.9	38.10	42.38	46.65	8.10	16.68	81.38
HZ 880M C	14.04	2,042.8	127.7	118.8	39.23	43.50	47.77	8.10	16.68	81.38
HZ 1080M A	14.67	3,335.9	161.6	151.6	41.34	45.63	49.91	8.08	18.16	81.38
HZ 1080M B	15.19	3,560.4	171.5	161.8	43.10	47.39	51.68	8.08	18.16	81.38
HZ 1080M C	16.13	3,834.9	183.6	174.3	46.33	50.61	54.90	8.08	18.17	81.38
HZ 1080M D	16.90	4,103.7	195.1	186.5	48.95	53.23	57.52	8.09	18.17	81.38
HZ 1180M A	17.51	4,305.4	203.1	195.9	51.04	55.32	59.60	8.09	18.17	81.38
HZ 1180M B	17.88	4,470.0	210.1	203.2	52.29	56.57	60.85	8.09	18.18	81.38
HZ 1180M C	18.87	4,833.6	224.9	217.2	55.21	59.72	64.22	8.14	18.29	81.38
HZ 1180M D	19.42	5,010.3	232.3	225.2	57.08	61.59	66.09	8.16	18.31	81.38

Combination HZ ... M - 24 / AZ 13-770

Section	A	Iy	Wel.y*	Wel.y**	G60%	G80%	G100%	ALW	ALS	bsys
HZ 630M	16.98	1,590.6	124.0	114.1	51.64	54.70	57.77	9.55	16.00	97.01
HZ 880M A	16.03	2,497.8	148.8	137.7	48.62	51.59	54.56	9.81	17.67	99.92
HZ 880M B	17.20	2,696.2	160.7	149.3	52.59	55.56	58.53	9.83	17.69	99.92
HZ 880M C	17.74	2,834.9	168.5	157.3	54.42	57.39	60.36	9.83	17.69	99.92
HZ 1080M A	18.78	4,674.7	215.8	203.1	57.93	60.92	63.90	9.78	19.15	99.92
HZ 1080M B	19.62	5,041.5	232.1	219.6	60.81	63.80	66.78	9.79	19.16	99.92
HZ 1080M C	21.16	5,487.8	252.3	239.9	66.04	69.02	72.00	9.80	19.17	99.92
HZ 1080M D	22.41	5,925.3	271.2	259.7	70.30	73.28	76.25	9.80	19.17	99.92
HZ 1180M A	23.40	6,253.1	284.7	274.6	73.69	76.66	79.63	9.81	19.18	99.92
HZ 1180M B	24.00	6,521.4	296.1	286.7	75.71	78.69	81.66	9.82	19.21	99.92
HZ 1180M C	25.31	6,991.2	315.9	305.4	80.09	83.12	86.15	9.87	19.25	99.92
HZ 1180M D	26.20	7,277.5	328.2	318.4	83.12	86.14	89.16	9.91	19.28	99.92

Combination HZ ... M - 26 / AZ 13-770

Section	A	Iy	Wel.y*	Wel.y**	G60%	G80%	G100%	ALW	ALS	bsys
HZ 630M	17.75	1,708.1	140.8	129.0	53.21	56.81	60.40	9.55	16.86	97.01
HZ 880M A	16.78	2,699.1	170.5	157.1	50.15	53.63	57.11	9.81	18.39	99.92
HZ 880M B	17.95	2,896.2	182.1	168.5	54.12	57.59	61.07	9.83	18.41	99.92
HZ 880M C	18.48	3,034.5	189.8	176.6	55.94	59.42	62.90	9.83	18.41	99.92
HZ 1080M A	19.53	5,013.3	243.0	228.0	59.47	62.96	66.46	9.78	19.86	99.92
HZ 1080M B	20.37	5,379.3	259.2	244.6	62.35	65.84	69.34	9.79	19.87	99.92
HZ 1080M C	21.91	5,823.7	279.1	264.9	67.58	71.06	74.55	9.80	19.88	99.92
HZ 1080M D	23.16	6,259.9	297.7	284.7	71.83	75.32	78.80	9.80	19.88	99.92
HZ 1180M A	24.15	6,586.7	311.0	299.6	75.21	78.70	82.18	9.81	19.89	99.92
HZ 1180M B	24.74	6,854.7	322.4	311.8	77.24	80.72	84.21	9.82	19.90	99.92
HZ 1180M C	26.25	7,405.4	345.8	334.0	82.01	85.67	89.34	9.87	20.03	99.92
HZ 1180M D	27.14	7,690.7	357.9	346.9	85.03	88.69	92.35	9.91	20.07	99.92

[1] Values taking the intermediary sheet piles into account.

Section	Properties per foot of wall[1]							Per system		
	A	I_y	$W_{el.y}$ *	$W_{el.y}$ **	$G_{60\%}$	$G_{80\%}$	$G_{100\%}$	A_{LW}	A_{LS}	b_{sys}
	in²/ft	in⁴/ft	in³/ft	in³/ft	lb/ft²	lb/ft²	lb/ft²	ft²/ft	ft²/ft	in
Combination HZ ... M - 12 / AZ 14-770-10/10										
HZ 630M	13.05	1,041.1	**77.7**	87.1	36.43	40.43	**44.42**	7.96	14.34	79.92
HZ 880M A	12.54	1,608.1	**91.4**	104.4	34.83	38.75	**42.68**	8.09	15.90	81.38
HZ 880M B	13.27	1,734.5	**99.1**	111.4	37.31	41.23	**45.15**	8.10	15.90	81.38
HZ 880M C	13.60	1,820.3	**103.9**	116.5	38.43	42.35	**46.27**	8.10	15.90	81.38
HZ 1080M A	14.21	2,948.3	**131.0**	146.9	40.51	44.44	**48.38**	8.08	17.39	81.38
HZ 1080M B	14.74	3.178.8	**141.2**	157.4	42.31	46.24	**50.17**	8.08	17.39	81.38
HZ 1080M C	15.69	3,456.4	**153.8**	169.9	45.53	49.46	**53.39**	8.08	17.39	81.38
HZ 1080M D	16.46	3,727.3	**165.5**	182.2	48.16	52.08	**56.01**	8.09	17.39	81.38
HZ 1180M A	17.07	3,931.0	**173.9**	191.4	50.25	54.17	**58.10**	8.09	17.40	81.38
HZ 1180M B	17.46	4,109.6	**181.8**	199.3	51.58	55.51	**59.43**	8.09	17.41	81.38
HZ 1180M C	18.22	4,371.8	**192.1**	211.6	54.03	58.02	**62.01**	8.14	17.44	81.38
HZ 1180M D	18.83	4,578.1	**201.8**	220.0	56.09	60.08	**64.07**	8.16	17.46	81.38
Combination HZ ... M - 14 / AZ 14-770-10/10										
HZ 630M	13.91	1,176.7	**97.0**	88.8	38.07	42.70	**47.34**	7.96	15.27	79.92
HZ 880M A	13.39	1,846.2	**116.5**	107.4	36.46	41.01	**45.56**	8.09	16.67	81.38
HZ 880M B	14.11	1,968.1	**123.6**	114.5	38.91	43.46	**48.00**	8.10	16.68	81.38
HZ 880M C	14.44	2,053.0	**128.4**	119.4	40.04	44.58	**49.13**	8.10	16.68	81.38
HZ 1080M A	15.06	3,346.2	**162.1**	152.1	42.15	46.71	**51.27**	8.08	18.16	81.38
HZ 1080M B	15.58	3,570.6	**171.9**	162.3	43.92	48.48	**53.03**	8.08	18.16	81.38
HZ 1080M C	16.53	3.845.1	**184.1**	174.8	47.14	51.70	**56.25**	8.08	18.17	81.38
HZ 1080M D	17.30	4,113.9	**195.6**	187.0	49.77	54.32	**58.87**	8.09	18.17	81.38
HZ 1180M A	17.91	4,315.7	**203.6**	196.4	51.86	56.40	**60.95**	8.09	18.17	81.38
HZ 1180M B	18.28	4,480.2	**210.6**	203.7	53.10	57.65	**62.20**	8.09	18.18	81.38
HZ 1180M C	19.27	4,843.8	**225.4**	217.7	56.03	60.80	**65.58**	8.14	18.29	81.38
HZ 1180M D	19.82	5,020.5	**232.8**	225.7	57.90	62.67	**67.44**	8.16	18.31	81.38
Combination HZ ... M - 24 / AZ 14-770-10/10										
HZ 630M	17.31	1,599.2	**124.7**	114.7	52.32	55.61	**58.91**	9.55	16.00	97.01
HZ 880M A	16.36	2,506.1	**149.3**	138.1	49.28	52.47	**55.67**	9.81	17.67	99.92
HZ 880M B	17.52	2,704.5	**161.2**	149.8	53.25	56.44	**59.63**	9.83	17.69	99.92
HZ 880M C	18.06	2,843.2	**169.0**	157.7	55.08	58.27	**61.46**	9.83	17.69	99.92
HZ 1080M A	19.10	4,683.1	**216.2**	203.5	58.60	61.80	**65.01**	9.78	19.15	99.92
HZ 1080M B	19.95	5,049.9	**232.5**	219.9	61.48	64.68	**67.88**	9.79	19.16	99.92
HZ 1080M C	21.48	5,496.2	**252.7**	240.3	66.71	69.91	**73.10**	9.80	19.17	99.92
HZ 1080M D	22.73	5,933.7	**271.6**	260.1	70.96	74.16	**77.35**	9.80	19.17	99.92
HZ 1180M A	23.72	6,261.4	**285.1**	275.0	74.35	77.54	**80.73**	9.81	19.18	99.92
HZ 1180M B	24.32	6,529.7	**296.5**	287.1	76.37	79.57	**82.76**	9.82	19.21	99.92
HZ 1180M C	25.64	6,999.5	**316.3**	305.8	80.75	84.00	**87.25**	9.87	19.25	99.92
HZ 1180M D	26.52	7,285.8	**328.6**	318.8	83.78	87.02	**90.26**	9.91	19.28	99.92
Combination HZ ... M - 26 / AZ 14-770-10/10										
HZ 630M	18.08	1,716.7	**141.5**	129.6	53.90	57.71	**61.53**	9.55	16.86	97.01
HZ 880M A	17.11	2,707.5	**171.0**	157.5	50.81	54.51	**58.21**	9.81	18.39	99.92
HZ 880M B	18.27	2,904.5	**182.6**	169.0	54.78	58.47	**62.17**	9.83	18.41	99.92
HZ 880M C	18.81	3,042.8	**190.4**	177.1	56.60	60.30	**64.00**	9.83	18.41	99.92
HZ 1080M A	19.85	5,021.7	**243.4**	228.4	60.13	63.85	**67.56**	9.78	19.86	99.92
HZ 1080M B	20.70	5,387.6	**259.6**	245.0	63.01	66.73	**70.44**	9.79	19.87	99.92
HZ 1080M C	22.23	5,832.0	**279.5**	265.2	68.24	71.95	**75.66**	9.80	19.88	99.92
HZ 1080M D	23.48	6,268.3	**298.1**	285.1	72.49	76.20	**79.90**	9.80	19.88	99.92
HZ 1180M A	24.47	6,595.1	**311.4**	300.0	75.87	79.58	**83.28**	9.81	19.89	99.92
HZ 1180M B	25.07	6,863.0	**322.8**	312.2	77.90	81.61	**85.31**	9.82	19.90	99.92
HZ 1180M C	26.57	7,413.7	**346.2**	334.4	82.67	86.55	**90.44**	9.87	20.03	99.92
HZ 1180M D	27.46	7,699.0	**358.3**	347.3	85.69	89.57	**93.45**	9.91	20.07	99.92

[1] Values taking the intermediary sheet piles into account.

Combination HZ ... M - 12 / AZ 28-750

Section	A (in²/ft)	I_y (in⁴/ft)	$W_{el.y}$ * (in³/ft)	$W_{el.y}$ ** (in³/ft)	$G_{60\%}$ (lb/ft²)	$G_{80\%}$ (lb/ft²)	$G_{100\%}$ (lb/ft²)	A_{LW} (ft²/ft)	A_{LS} (ft²/ft)	b_{sys} (in)
	Properties per foot of wall[1]							Per system		
HZ 630M	14.40	1,319.5	**98.5**	110.3	39.37	44.19	**49.00**	8.84	15.22	78.35
HZ 880M A	13.85	1,892.5	**107.6**	122.9	37.69	42.41	**47.13**	8.96	16.77	79.80
HZ 880M B	14.59	2,021.1	**115.5**	129.9	40.21	44.93	**49.65**	8.97	16.78	79.80
HZ 880M C	14.93	2,108.6	**120.4**	135.0	41.35	46.07	**50.79**	8.97	16.78	79.80
HZ 1080M A	15.56	3,259.8	**144.8**	162.4	43.49	48.22	**52.95**	8.95	18.26	79.80
HZ 1080M B	16.10	3,494.8	**155.2**	173.1	45.32	50.05	**54.78**	8.95	18.26	79.80
HZ 1080M C	17.06	3,777.6	**168.1**	185.7	48.61	53.33	**58.06**	8.96	18.27	79.80
HZ 1080M D	17.85	4,053.7	**180.0**	198.2	51.28	56.00	**60.73**	8.96	18.27	79.80
HZ 1180M A	18.47	4,261.2	**188.5**	207.5	53.41	58.13	**62.86**	8.96	18.27	79.80
HZ 1180M B	18.87	4,443.3	**196.6**	215.5	54.77	59.49	**64.22**	8.97	18.28	79.80
HZ 1180M C	19.64	4,710.6	**207.0**	228.0	57.27	62.06	**66.85**	9.01	18.31	79.80
HZ 1180M D	20.26	4,920.8	**216.9**	236.5	59.36	64.15	**68.94**	9.03	18.33	79.80

Combination HZ ... M - 14 / AZ 28-750

Section	A (in²/ft)	I_y (in⁴/ft)	$W_{el.y}$ * (in³/ft)	$W_{el.y}$ ** (in³/ft)	$G_{60\%}$ (lb/ft²)	$G_{80\%}$ (lb/ft²)	$G_{100\%}$ (lb/ft²)	A_{LW} (ft²/ft)	A_{LS} (ft²/ft)	b_{sys} (in)
HZ 630M	15.27	1,457.8	**120.1**	110.0	41.04	46.51	**51.97**	8.84	16.14	78.35
HZ 880M A	14.71	2,135.3	**134.8**	124.2	39.35	44.71	**50.07**	8.96	17.54	79.80
HZ 880M B	15.44	2,259.3	**141.9**	131.4	41.85	47.20	**52.56**	8.97	17.55	79.80
HZ 880M C	15.78	2,345.9	**146.7**	136.4	42.99	48.35	**53.71**	8.97	17.55	79.80
HZ 1080M A	16.43	3,665.5	**177.5**	166.6	45.16	50.53	**55.90**	8.95	19.03	79.80
HZ 1080M B	16.96	3,894.4	**187.5**	177.0	46.96	52.33	**57.70**	8.95	19.04	79.80
HZ 1080M C	17.92	4,174.0	**199.9**	189.7	50.25	55.61	**60.98**	8.96	19.04	79.80
HZ 1080M D	18.70	4,447.9	**211.4**	202.2	52.92	58.28	**63.65**	8.96	19.04	79.80
HZ 1180M A	19.33	4,653.5	**219.6**	211.8	55.05	60.41	**65.77**	8.96	19.05	79.80
HZ 1180M B	19.70	4,821.3	**226.7**	219.2	56.32	61.68	**67.04**	8.97	19.05	79.80
HZ 1180M C	20.71	5,191.9	**241.6**	233.3	59.30	64.89	**70.48**	9.01	19.16	79.80
HZ 1180M D	21.27	5,371.9	**249.1**	241.5	61.20	66.79	**72.38**	9.03	19.18	79.80

Combination HZ ... M - 24 / AZ 28-750

Section	A (in²/ft)	I_y (in⁴/ft)	$W_{el.y}$ * (in³/ft)	$W_{el.y}$ ** (in³/ft)	$G_{60\%}$ (lb/ft²)	$G_{80\%}$ (lb/ft²)	$G_{100\%}$ (lb/ft²)	A_{LW} (ft²/ft)	A_{LS} (ft²/ft)	b_{sys} (in)
HZ 630M	18.48	1,837.0	**143.2**	131.8	55.00	58.95	**62.90**	10.43	16.87	95.43
HZ 880M A	17.48	2,751.2	**163.9**	151.6	51.83	55.66	**59.49**	10.68	18.55	98.35
HZ 880M B	18.66	2,952.4	**175.9**	163.5	55.86	59.68	**63.51**	10.70	18.57	98.35
HZ 880M C	19.21	3,093.3	**183.8**	171.6	57.71	61.54	**65.37**	10.70	18.57	98.35
HZ 1080M A	20.27	4,963.9	**229.2**	215.7	61.30	65.15	**68.99**	10.65	20.02	98.35
HZ 1080M B	21.13	5,336.6	**245.7**	232.4	64.23	68.07	**71.92**	10.66	20.03	98.35
HZ 1080M C	22.69	5,789.6	**266.1**	253.1	69.54	73.38	**77.21**	10.67	20.04	98.35
HZ 1080M D	23.96	6,233.8	**285.3**	273.3	73.86	77.69	**81.53**	10.67	20.05	98.35
HZ 1180M A	24.96	6,566.6	**298.9**	288.4	77.30	81.13	**84.96**	10.68	20.05	98.35
HZ 1180M B	25.57	6,839.2	**310.6**	300.7	79.35	83.19	**87.02**	10.69	20.08	98.35
HZ 1180M C	26.91	7,316.0	**330.6**	319.6	83.80	87.68	**91.57**	10.75	20.12	98.35
HZ 1180M D	27.81	7,606.6	**343.0**	332.8	86.87	90.75	**94.63**	10.79	20.15	98.35

Combination HZ ... M - 26 / AZ 28-750

Section	A (in²/ft)	I_y (in⁴/ft)	$W_{el.y}$ * (in³/ft)	$W_{el.y}$ ** (in³/ft)	$G_{60\%}$ (lb/ft²)	$G_{80\%}$ (lb/ft²)	$G_{100\%}$ (lb/ft²)	A_{LW} (ft²/ft)	A_{LS} (ft²/ft)	b_{sys} (in)
HZ 630M	19.27	1,956.4	**161.3**	147.7	56.60	61.09	**65.57**	10.43	17.73	95.43
HZ 880M A	18.24	2,955.8	**186.7**	172.0	53.38	57.73	**62.08**	10.68	19.26	98.35
HZ 880M B	19.42	3,155.6	**198.4**	183.6	57.41	61.75	**66.09**	10.70	19.28	98.35
HZ 880M C	19.97	3,296.1	**206.2**	191.8	59.27	63.61	**67.95**	10.70	19.28	98.35
HZ 1080M A	21.04	5,308.0	**257.2**	241.4	62.86	67.22	**71.59**	10.65	20.74	98.35
HZ 1080M B	21.90	5,679.7	**273.7**	258.3	65.79	70.15	**74.51**	10.66	20.74	98.35
HZ 1080M C	23.45	6,130.8	**293.8**	278.8	71.09	75.45	**79.81**	10.67	20.75	98.35
HZ 1080M D	24.72	6,573.8	**312.7**	299.0	75.41	79.77	**84.12**	10.67	20.76	98.35
HZ 1180M A	25.73	6,905.6	**326.0**	314.1	78.85	83.20	**87.55**	10.68	20.76	98.35
HZ 1180M B	26.33	7,177.8	**337.6**	326.5	80.91	85.26	**89.61**	10.69	20.77	98.35
HZ 1180M C	27.86	7,736.8	**361.3**	348.9	85.75	90.28	**94.81**	10.75	20.90	98.35
HZ 1180M D	28.76	8,026.4	**373.5**	362.0	88.81	93.34	**97.87**	10.79	20.94	98.35

[1] Values taking the intermediary sheet piles into account.

Section	Properties per foot of wall[1]							Per system		
	A	I_y	$W_{el.y}$ *	$W_{el.y}$ **	$G_{60\%}$	$G_{80\%}$	$G_{100\%}$	A_{LW}	A_{LS}	b_{sys}
	in²/ft	in⁴/ft	in³/ft	in³/ft	lb/ft²	lb/ft²	lb/ft²	ft²/ft	ft²/ft	in
Combination HZ ... M - 12 / AZ 30-750										
HZ 630M	14.88	1,347.8	**100.6**	112.7	40.36	45.50	**50.64**	8.84	15.22	78.35
HZ 880M A	14.32	1,920.3	**109.2**	124.7	38.65	43.70	**48.74**	8.97	16.77	79.80
HZ 880M B	15.06	2,048.9	**117.1**	131.6	41.17	46.21	**51.25**	8.98	16.78	79.80
HZ 880M C	15.40	2,136.3	**122.0**	136.7	42.32	47.36	**52.40**	8.98	16.78	79.80
HZ 1080M A	16.03	3,287.6	**146.0**	163.8	44.45	49.51	**54.57**	8.95	18.27	79.80
HZ 1080M B	16.57	3,522.6	**156.5**	174.5	46.28	51.34	**56.39**	8.96	18.27	79.80
HZ 1080M C	17.53	3,805.4	**169.3**	187.0	49.57	54.62	**59.67**	8.96	18.27	79.80
HZ 1080M D	18.32	4,081.5	**181.2**	199.5	52.24	57.29	**62.34**	8.96	18.27	79.80
HZ 1180M A	18.94	4,288.9	**189.7**	208.9	54.38	59.42	**64.47**	8.97	18.27	79.80
HZ 1180M B	19.34	4,471.1	**197.8**	216.9	55.74	60.78	**65.83**	8.97	18.29	79.80
HZ 1180M C	20.12	4,738.3	**208.2**	229.4	58.23	63.35	**68.46**	9.01	18.32	79.80
HZ 1180M D	20.73	4,948.5	**218.1**	237.8	60.33	65.44	**70.55**	9.03	18.33	79.80
Combination HZ ... M - 14 / AZ 30-750										
HZ 630M	15.75	1,486.1	**122.4**	112.1	42.03	47.82	**53.61**	8.84	16.14	78.35
HZ 880M A	15.19	2,163.0	**136.6**	125.8	40.31	46.00	**51.68**	8.97	17.55	79.80
HZ 880M B	15.92	2,287.0	**143.7**	133.0	42.81	48.49	**54.17**	8.98	17.56	79.80
HZ 880M C	16.25	2,373.7	**148.4**	138.0	43.96	49.64	**55.31**	8.98	17.56	79.80
HZ 1080M A	16.90	3,693.3	**178.9**	167.8	46.13	51.82	**57.52**	8.95	19.04	79.80
HZ 1080M B	17.43	3,922.2	**188.9**	178.3	47.93	53.62	**59.32**	8.96	19.04	79.80
HZ 1080M C	18.39	4,201.8	**201.2**	191.0	51.21	56.90	**62.59**	8.96	19.05	79.80
HZ 1080M D	19.18	4,475.7	**212.8**	203.5	53.88	59.57	**65.26**	8.96	19.05	79.80
HZ 1180M A	19.80	4,681.2	**220.9**	213.0	56.01	61.70	**67.38**	8.97	19.05	79.80
HZ 1180M B	20.17	4,849.0	**228.0**	220.4	57.28	62.97	**68.65**	8.97	19.06	79.80
HZ 1180M C	21.18	5,219.6	**242.8**	234.6	60.26	66.18	**72.09**	9.01	19.17	79.80
HZ 1180M D	21.74	5,399.6	**250.4**	242.7	62.17	68.08	**73.99**	9.03	19.19	79.80
Combination HZ ... M - 24 / AZ 30-750										
HZ 630M	18.88	1,860.3	**145.0**	133.4	55.81	60.03	**64.25**	10.43	16.88	95.43
HZ 880M A	17.86	2,773.7	**165.2**	152.9	52.61	56.70	**60.79**	10.68	18.55	98.35
HZ 880M B	19.04	2,974.9	**177.3**	164.7	56.64	60.72	**64.81**	10.70	18.57	98.35
HZ 880M C	19.59	3,115.8	**185.2**	172.9	58.50	62.58	**66.67**	10.70	18.57	98.35
HZ 1080M A	20.66	4,986.5	**230.2**	216.7	62.09	66.20	**70.30**	10.66	20.03	98.35
HZ 1080M B	21.52	5,359.2	**246.7**	233.4	65.01	69.12	**73.23**	10.66	20.04	98.35
HZ 1080M C	23.07	5,812.1	**267.2**	254.1	70.32	74.42	**78.52**	10.67	20.05	98.35
HZ 1080M D	24.34	6,256.4	**286.3**	274.3	74.64	78.74	**82.83**	10.68	20.05	98.35
HZ 1180M A	25.35	6,589.1	**300.0**	289.4	78.08	82.17	**86.26**	10.68	20.06	98.35
HZ 1180M B	25.95	6,861.7	**311.6**	301.7	80.14	84.23	**88.32**	10.69	20.08	98.35
HZ 1180M C	27.29	7,338.5	**331.6**	320.6	84.58	88.73	**92.87**	10.75	20.13	98.35
HZ 1180M D	28.19	7,629.0	**344.0**	333.8	87.65	91.79	**95.93**	10.79	20.16	98.35
Combination HZ ... M - 26 / AZ 30-750										
HZ 630M	19.66	1,979.6	**163.2**	149.5	57.41	62.16	**66.92**	10.43	17.73	95.43
HZ 880M A	18.62	2,978.3	**188.2**	173.3	54.16	58.77	**63.38**	10.68	19.26	98.35
HZ 880M B	19.80	3,178.1	**199.8**	184.9	58.19	62.79	**67.40**	10.70	19.28	98.35
HZ 880M C	20.35	3,318.5	**207.6**	193.1	60.05	64.65	**69.25**	10.70	19.28	98.35
HZ 1080M A	21.42	5,330.5	**258.3**	242.4	63.65	68.27	**72.90**	10.66	20.74	98.35
HZ 1080M B	22.28	5,702.3	**274.8**	259.3	66.57	71.20	**75.82**	10.66	20.75	98.35
HZ 1080M C	23.83	6,153.3	**294.9**	279.9	71.88	76.50	**81.11**	10.67	20.76	98.35
HZ 1080M D	25.10	6,596.3	**313.7**	300.0	76.20	80.81	**85.43**	10.68	20.76	98.35
HZ 1180M A	26.11	6,928.1	**327.1**	315.1	79.63	84.24	**88.85**	10.68	20.77	98.35
HZ 1180M B	26.71	7,200.3	**338.7**	327.5	81.69	86.30	**90.91**	10.69	20.78	98.35
HZ 1180M C	28.24	7,759.3	**362.4**	349.9	86.53	91.32	**96.11**	10.75	20.90	98.35
HZ 1180M D	29.14	8,048.9	**374.6**	363.1	89.59	94.38	**99.17**	10.79	20.94	98.35

[1] Values taking the intermediary sheet piles into account.

Section	A	I_y	$W_{el.y}$ *	$W_{el.y}$ **	$G_{60\%}$	$G_{80\%}$	$G_{100\%}$	A_{LW}	A_{LS}	b_{sys}
	Properties per foot of wall[1]							Per system		
	in²/ft	in⁴/ft	in³/ft	in³/ft	lb/ft²	lb/ft²	lb/ft²	ft²/ft	ft²/ft	in
Combination HZ ... M - 12 / AZ 32-750										
HZ 630M	15.36	1,376.2	**102.8**	115.1	41.34	46.81	**52.28**	8.84	15.23	78.35
HZ 880M A	14.80	1,948.1	**110.8**	126.5	39.62	44.98	**50.35**	8.97	16.78	79.80
HZ 880M B	15.53	2,076.7	**118.7**	133.4	42.14	47.50	**52.86**	8.98	16.78	79.80
HZ 880M C	15.87	2,164.1	**123.6**	138.5	43.28	48.65	**54.01**	8.98	16.78	79.80
HZ 1080M A	16.51	3,315.5	**147.3**	165.2	45.42	50.80	**56.18**	8.96	18.27	79.80
HZ 1080M B	17.04	3,550.5	**157.7**	175.8	47.25	52.63	**58.01**	8.96	18.27	79.80
HZ 1080M C	18.01	3,833.3	**170.5**	188.4	50.54	55.91	**61.28**	8.97	18.27	79.80
HZ 1080M D	18.79	4,109.4	**182.4**	200.9	53.21	58.58	**63.95**	8.97	18.28	79.80
HZ 1180M A	19.42	4,316.8	**191.0**	210.2	55.34	60.71	**66.08**	8.97	18.28	79.80
HZ 1180M B	19.82	4,498.9	**199.0**	218.2	56.70	62.07	**67.44**	8.98	18.29	79.80
HZ 1180M C	20.59	4,766.1	**209.4**	230.7	59.20	64.63	**70.07**	9.02	18.32	79.80
HZ 1180M D	21.20	4,976.3	**219.4**	239.1	61.29	66.72	**72.16**	9.04	18.34	79.80
Combination HZ ... M - 14 / AZ 32-750										
HZ 630M	16.24	1,514.5	**124.8**	114.3	43.01	49.13	**55.25**	8.84	16.15	78.35
HZ 880M A	15.66	2,190.9	**138.3**	127.4	41.28	47.29	**53.29**	8.97	17.55	79.80
HZ 880M B	16.39	2,314.9	**145.4**	134.6	43.78	49.78	**55.78**	8.98	17.56	79.80
HZ 880M C	16.73	2,401.5	**150.1**	139.7	44.92	50.92	**56.92**	8.98	17.56	79.80
HZ 1080M A	17.37	3,721.2	**180.2**	169.1	47.09	53.11	**59.13**	8.96	19.04	79.80
HZ 1080M B	17.90	3,950.1	**190.2**	179.5	48.89	54.91	**60.93**	8.96	19.05	79.80
HZ 1080M C	18.87	4,229.6	**202.6**	192.3	52.18	58.19	**64.20**	8.97	19.05	79.80
HZ 1080M D	19.65	4,503.6	**214.1**	204.7	54.85	60.86	**66.87**	8.97	19.05	79.80
HZ 1180M A	20.27	4,709.1	**222.2**	214.3	56.98	62.98	**68.99**	8.97	19.05	79.80
HZ 1180M B	20.65	4,876.9	**229.3**	221.7	58.25	64.25	**70.26**	8.98	19.06	79.80
HZ 1180M C	21.66	5,247.4	**244.1**	235.8	61.23	67.46	**73.70**	9.02	19.17	79.80
HZ 1180M D	22.21	5,427.5	**251.7**	244.0	63.13	69.37	**75.60**	9.04	19.19	79.80
Combination HZ ... M - 24 / AZ 32-750										
HZ 630M	19.27	1,883.6	**146.9**	135.1	56.61	61.10	**65.60**	10.43	16.88	95.43
HZ 880M A	18.25	2,796.3	**166.6**	154.1	53.39	57.75	**62.10**	10.69	18.56	98.35
HZ 880M B	19.43	2,997.4	**178.6**	166.0	57.42	61.77	**66.11**	10.71	18.58	98.35
HZ 880M C	19.97	3,138.3	**186.5**	174.1	59.28	63.63	**67.97**	10.71	18.57	98.35
HZ 1080M A	21.04	5,009.2	**231.3**	217.6	62.87	67.24	**71.61**	10.66	20.03	98.35
HZ 1080M B	21.90	5,381.8	**247.7**	234.4	65.80	70.17	**74.54**	10.67	20.04	98.35
HZ 1080M C	23.46	5,834.8	**268.2**	255.1	71.11	75.47	**79.83**	10.68	20.05	98.35
HZ 1080M D	24.72	6,279.0	**287.4**	275.2	75.43	79.78	**84.14**	10.68	20.05	98.35
HZ 1180M A	25.73	6,611.7	**301.0**	290.4	78.86	83.22	**87.57**	10.69	20.06	98.35
HZ 1180M B	26.34	6,884.3	**312.6**	302.7	80.92	85.28	**89.63**	10.70	20.09	98.35
HZ 1180M C	27.67	7,361.0	**332.7**	321.6	85.37	89.77	**94.17**	10.75	20.13	98.35
HZ 1180M D	28.57	7,651.6	**345.0**	334.8	88.43	92.83	**97.23**	10.79	20.16	98.35
Combination HZ ... M - 26 / AZ 32-750										
HZ 630M	20.06	2,002.9	**165.1**	151.2	58.22	63.24	**68.26**	10.43	17.74	95.43
HZ 880M A	19.01	3,000.9	**189.6**	174.6	54.95	59.82	**64.69**	10.69	19.27	98.35
HZ 880M B	20.19	3,200.6	**201.2**	186.3	58.97	63.84	**68.70**	10.71	19.29	98.35
HZ 880M C	20.73	3,341.1	**209.0**	194.4	60.83	65.69	**70.56**	10.71	19.29	98.35
HZ 1080M A	21.81	5,353.2	**259.4**	243.4	64.43	69.32	**74.21**	10.66	20.75	98.35
HZ 1080M B	22.66	5,725.0	**275.9**	260.4	67.36	72.25	**77.13**	10.67	20.75	98.35
HZ 1080M C	24.22	6,176.0	**295.9**	280.9	72.66	77.54	**82.42**	10.68	20.76	98.35
HZ 1080M D	25.49	6,618.9	**314.8**	301.0	76.98	81.86	**86.73**	10.68	20.77	98.35
HZ 1180M A	26.49	6,950.7	**328.1**	316.1	80.41	85.29	**90.16**	10.69	20.77	98.35
HZ 1180M B	27.10	7,222.9	**339.7**	328.5	82.47	87.35	**92.22**	10.70	20.78	98.35
HZ 1180M C	28.63	7,781.8	**363.4**	351.0	87.31	92.36	**97.42**	10.75	20.91	98.35
HZ 1180M D	29.52	8,071.4	**375.6**	364.1	90.37	95.42	**100.47**	10.79	20.95	98.35

[1] Values taking the intermediary sheet piles into account.

Combination HZ ... M - 12 / AZ 13-700

Section	A	I_y	$W_{el.y}$ *	$W_{el.y}$ **	$G_{60\%}$	$G_{80\%}$	$G_{100\%}$	A_{LW}	A_{LS}	b_{sys}
	Properties per foot of wall[1]							Per system		
	in²/ft	in⁴/ft	in³/ft	in³/ft	lb/ft²	lb/ft²	lb/ft²	ft²/ft	ft²/ft	in
HZ 630M	13.45	1,084.9	**81.0**	90.7	37.97	41.88	**45.78**	7.52	13.90	74.41
HZ 880M A	12.90	1,692.3	**96.2**	109.9	36.22	40.05	**43.88**	7.65	15.46	75.87
HZ 880M B	13.67	1,827.8	**104.5**	117.4	38.88	42.71	**46.53**	7.66	15.46	75.87
HZ 880M C	14.03	1,919.8	**109.6**	122.9	40.09	43.91	**47.74**	7.66	15.46	75.87
HZ 1080M A	14.69	3,130.2	**139.0**	155.9	42.32	46.16	**50.00**	7.64	16.95	75.87
HZ 1080M B	15.26	3,377.4	**150.0**	167.3	44.25	48.09	**51.92**	7.64	16.95	75.87
HZ 1080M C	16.27	3,675.1	**163.5**	180.6	47.71	51.54	**55.38**	7.65	16.95	75.87
HZ 1080M D	17.10	3,965.5	**176.0**	193.9	50.52	54.35	**58.19**	7.65	16.96	75.87
HZ 1180M A	17.76	4,183.8	**185.1**	203.8	52.76	56.59	**60.42**	7.65	16.96	75.87
HZ 1180M B	18.18	4,375.4	**193.6**	212.2	54.19	58.02	**61.85**	7.65	16.97	75.87
HZ 1180M C	18.99	4,656.5	**204.6**	225.4	56.82	60.72	**64.63**	7.70	17.00	75.87
HZ 1180M D	19.64	4,877.7	**215.0**	234.4	59.03	62.93	**66.83**	7.72	17.02	75.87

Combination HZ ... M - 14 / AZ 13-700

Section	A	I_y	$W_{el.y}$ *	$W_{el.y}$ **	$G_{60\%}$	$G_{80\%}$	$G_{100\%}$	A_{LW}	A_{LS}	b_{sys}
HZ 630M	14.37	1,230.6	**101.4**	92.9	39.73	44.32	**48.91**	7.52	14.83	74.41
HZ 880M A	13.80	1,947.6	**123.0**	113.3	37.97	42.47	**46.98**	7.65	16.23	75.87
HZ 880M B	14.57	2,078.3	**130.6**	120.9	40.60	45.10	**49.60**	7.66	16.24	75.87
HZ 880M C	14.93	2,169.4	**135.6**	126.2	41.81	46.30	**50.80**	7.66	16.24	75.87
HZ 1080M A	15.60	3,557.0	**172.3**	161.7	44.08	48.59	**53.10**	7.64	17.72	75.87
HZ 1080M B	16.16	3,797.8	**182.9**	172.6	45.98	50.49	**55.00**	7.64	17.72	75.87
HZ 1080M C	17.17	4,092.0	**196.0**	186.0	49.44	53.94	**58.45**	7.65	17.73	75.87
HZ 1080M D	18.00	4,380.2	**208.2**	199.1	52.25	56.75	**61.25**	7.65	17.73	75.87
HZ 1180M A	18.66	4,596.4	**216.9**	209.2	54.49	58.99	**63.49**	7.65	17.73	75.87
HZ 1180M B	19.05	4,772.9	**224.4**	217.0	55.82	60.32	**64.82**	7.65	17.74	75.87
HZ 1180M C	20.11	5,162.8	**240.2**	232.0	58.96	63.70	**68.45**	7.70	17.85	75.87
HZ 1180M D	20.70	5,352.2	**248.2**	240.6	60.96	65.70	**70.45**	7.72	17.87	75.87

Combination HZ ... M - 24 / AZ 13-700

Section	A	I_y	$W_{el.y}$ *	$W_{el.y}$ **	$G_{60\%}$	$G_{80\%}$	$G_{100\%}$	A_{LW}	A_{LS}	b_{sys}
HZ 630M	17.89	1,668.5	**130.1**	119.7	54.53	57.71	**60.89**	9.11	15.56	91.50
HZ 880M A	16.86	2,626.1	**156.4**	144.7	51.24	54.32	**57.39**	9.37	17.23	94.41
HZ 880M B	18.10	2,835.9	**169.0**	157.0	55.44	58.51	**61.58**	9.39	17.26	94.41
HZ 880M C	18.66	2,982.6	**177.3**	165.5	57.38	60.45	**63.52**	9.39	17.25	94.41
HZ 1080M A	19.77	4,930.9	**227.6**	214.2	61.11	64.20	**67.29**	9.34	18.71	94.41
HZ 1080M B	20.67	5,319.2	**244.9**	231.7	64.16	67.25	**70.33**	9.35	18.72	94.41
HZ 1080M C	22.29	5,791.1	**266.2**	253.2	69.69	72.77	**75.86**	9.36	18.73	94.41
HZ 1080M D	23.61	6,253.9	**286.2**	274.1	74.19	77.27	**80.35**	9.36	18.73	94.41
HZ 1180M A	24.66	6,600.5	**300.5**	289.9	77.77	80.85	**83.93**	9.37	18.74	94.41
HZ 1180M B	25.29	6,884.4	**312.6**	302.7	79.92	82.99	**86.07**	9.38	18.77	94.41
HZ 1180M C	26.68	7,381.0	**333.6**	322.5	84.55	87.68	**90.81**	9.43	18.81	94.41
HZ 1180M D	27.62	7,683.6	**346.5**	336.2	87.74	90.87	**94.00**	9.47	18.84	94.41

Combination HZ ... M - 26 / AZ 13-700

Section	A	I_y	$W_{el.y}$ *	$W_{el.y}$ **	$G_{60\%}$	$G_{80\%}$	$G_{100\%}$	A_{LW}	A_{LS}	b_{sys}
HZ 630M	18.71	1,793.0	**147.8**	135.4	56.20	59.94	**63.67**	9.11	16.42	91.50
HZ 880M A	17.66	2,839.2	**179.4**	165.2	52.86	56.47	**60.09**	9.37	17.95	94.41
HZ 880M B	18.89	3,047.5	**191.6**	177.3	57.06	60.67	**64.28**	9.39	17.97	94.41
HZ 880M C	19.46	3,193.9	**199.8**	185.9	58.99	62.60	**66.21**	9.39	17.97	94.41
HZ 1080M A	20.57	5,289.3	**256.3**	240.5	62.74	66.36	**69.99**	9.34	19.42	94.41
HZ 1080M B	21.46	5,676.7	**273.6**	258.2	65.78	69.41	**73.04**	9.35	19.43	94.41
HZ 1080M C	23.08	6,146.6	**294.5**	279.5	71.31	74.93	**78.56**	9.36	19.44	94.41
HZ 1080M D	24.40	6.608.0	**314.3**	300.5	75.81	79.43	**83.05**	9.36	19.45	94.41
HZ 1180M A	25.45	6,953.6	**328.3**	316.3	79.39	83.01	**86.62**	9.37	19.45	94.41
HZ 1180M B	26.08	7,237.2	**340.4**	329.2	81.54	85.15	**88.77**	9.38	19.46	94.41
HZ 1180M C	27.68	7,819.3	**365.2**	352.6	86.57	90.38	**94.19**	9.43	19.59	94.41
HZ 1180M D	28.61	8,120.9	**377.9**	366.3	89.76	93.57	**97.37**	9.47	19.63	94.41

[1] Values taking the intermediary sheet piles into account.

Section	Properties per foot of wall[1]							Per system		
	A	I_y	$W_{el.y}$ *	$W_{el.y}$ **	$G_{60\%}$	$G_{80\%}$	$G_{100\%}$	A_{LW}	A_{LS}	b_{sys}
	in²/ft	in⁴/ft	in³/ft	in³/ft	lb/ft²	lb/ft²	lb/ft²	ft²/ft	ft²/ft	in

Combination HZ ... M - 12 / AZ 13-700-10/10

Section	A	I_y	W_el.y *	W_el.y **	G_60%	G_80%	G_100%	A_LW	A_LS	b_sys
HZ 630M	13.66	1,089.5	**81.3**	91.1	38.38	42.43	**46.47**	7.52	13.90	74.41
HZ 880M A	13.09	1,696.7	**96.5**	110.2	36.63	40.59	**44.56**	7.65	15.46	75.87
HZ 880M B	13.87	1,832.2	**104.7**	117.7	39.28	43.24	**47.20**	7.66	15.46	75.87
HZ 880M C	14.22	1,924.2	**109.9**	123.1	40.49	44.45	**48.41**	7.66	15.46	75.87
HZ 1080M A	14.89	3,134.6	**139.2**	156.2	42.73	46.70	**50.68**	7.64	16.95	75.87
HZ 1080M B	15.46	3,381.8	**150.2**	167.5	44.65	48.63	**52.60**	7.64	16.95	75.87
HZ 1080M C	16.47	3,679.5	**163.7**	180.8	48.11	52.08	**56.05**	7.65	16.95	75.87
HZ 1080M D	17.30	3,970.0	**176.2**	194.1	50.93	54.89	**58.86**	7.65	16.96	75.87
HZ 1180M A	17.95	4,188.2	**185.3**	204.0	53.17	57.13	**61.10**	7.65	16.96	75.87
HZ 1180M B	18.37	4,379.8	**193.8**	212.5	54.60	58.56	**62.53**	7.65	16.97	75.87
HZ 1180M C	19.19	4,660.9	**204.8**	225.6	57.22	61.26	**65.30**	7.70	17.00	75.87
HZ 1180M D	19.83	4,882.1	**215.2**	234.6	59.43	63.46	**67.50**	7.72	17.02	75.87

Combination HZ ... M - 14 / AZ 13-700-10/10

Section	A	I_y	W_el.y *	W_el.y **	G_60%	G_80%	G_100%	A_LW	A_LS	b_sys
HZ 630M	14.57	1,235.1	**101.8**	93.2	40.14	44.87	**49.60**	7.52	14.83	74.41
HZ 880M A	14.00	1,952.0	**123.2**	113.5	38.38	43.01	**47.65**	7.65	16.23	75.87
HZ 880M B	14.77	2,082.7	**130.8**	121.1	41.01	45.64	**50.27**	7.66	16.24	75.87
HZ 880M C	15.13	2,173.8	**135.9**	126.4	42.21	46.84	**51.47**	7.66	16.24	75.87
HZ 1080M A	15.80	3,561.4	**172.5**	161.9	44.49	49.13	**53.78**	7.64	17.72	75.87
HZ 1080M B	16.36	3,802.2	**183.1**	172.8	46.38	51.03	**55.67**	7.64	17.72	75.87
HZ 1080M C	17.37	4,096.4	**196.2**	186.2	49.84	54.48	**59.12**	7.65	17.73	75.87
HZ 1080M D	18.20	4,384.6	**208.4**	199.3	52.65	57.29	**61.93**	7.65	17.73	75.87
HZ 1180M A	18.85	4,600.9	**217.1**	209.4	54.89	59.53	**64.16**	7.65	17.73	75.87
HZ 1180M B	19.25	4,777.4	**224.6**	217.2	56.23	60.86	**65.50**	7.65	17.74	75.87
HZ 1180M C	20.31	5,167.2	**240.4**	232.2	59.36	64.24	**69.12**	7.70	17.85	75.87
HZ 1180M D	20.90	5,356.6	**248.4**	240.8	61.37	66.24	**71.12**	7.72	17.87	75.87

Combination HZ ... M - 24 / AZ 13-700-10/10

Section	A	I_y	W_el.y *	W_el.y **	G_60%	G_80%	G_100%	A_LW	A_LS	b_sys
HZ 630M	18.05	1,672.2	**130.4**	119.9	54.87	58.16	**61.44**	9.11	15.56	91.50
HZ 880M A	17.02	2,629.7	**156.7**	144.9	51.57	54.75	**57.94**	9.37	17.23	94.41
HZ 880M B	18.25	2,839.4	**169.2**	157.2	55.76	58.94	**62.12**	9.39	17.26	94.41
HZ 880M C	18.82	2,986.2	**177.5**	165.7	57.70	60.88	**64.06**	9.39	17.25	94.41
HZ 1080M A	19.93	4,934.5	**227.8**	214.4	61.44	64.63	**67.83**	9.34	18.71	94.41
HZ 1080M B	20.83	5,322.7	**245.0**	231.8	64.49	67.68	**70.88**	9.35	18.72	94.41
HZ 1080M C	22.45	5,794.7	**266.4**	253.3	70.02	73.21	**76.40**	9.36	18.73	94.41
HZ 1080M D	23.77	6,257.4	**286.4**	274.3	74.52	77.70	**80.89**	9.36	18.73	94.41
HZ 1180M A	24.82	6,604.0	**300.7**	290.0	78.10	81.28	**84.47**	9.37	18.74	94.41
HZ 1180M B	25.45	6,888.0	**312.8**	302.8	80.24	83.43	**86.61**	9.38	18.77	94.41
HZ 1180M C	26.84	7,384.6	**333.7**	322.6	84.87	88.11	**91.35**	9.43	18.81	94.41
HZ 1180M D	27.78	7,687.1	**346.7**	336.3	88.06	91.30	**94.54**	9.47	18.84	94.41

Combination HZ ... M - 26 / AZ 13-700-10/10

Section	A	I_y	W_el.y *	W_el.y **	G_60%	G_80%	G_100%	A_LW	A_LS	b_sys
HZ 630M	18.87	1,796.7	**148.1**	135.7	56.54	60.38	**64.23**	9.11	16.42	91.50
HZ 880M A	17.82	2,842.8	**179.6**	165.4	53.18	56.91	**60.63**	9.37	17.95	94.41
HZ 880M B	19.05	3,051.1	**191.8**	177.6	57.38	61.10	**64.82**	9.39	17.97	94.41
HZ 880M C	19.61	3,197.4	**200.0**	186.1	59.32	63.03	**66.75**	9.39	17.97	94.41
HZ 1080M A	20.73	5,292.9	**256.5**	240.7	63.06	66.80	**70.53**	9.34	19.42	94.41
HZ 1080M B	21.62	5,680.2	**273.7**	258.3	66.11	69.85	**73.58**	9.35	19.43	94.41
HZ 1080M C	23.24	6,150.1	**294.7**	279.7	71.64	75.37	**79.10**	9.36	19.44	94.41
HZ 1080M D	24.56	6,611.6	**314.5**	300.7	76.14	79.86	**83.59**	9.36	19.45	94.41
HZ 1180M A	25.61	6,957.2	**328.4**	316.4	79.71	83.44	**87.16**	9.37	19.45	94.41
HZ 1180M B	26.24	7,240.7	**340.6**	329.3	81.86	85.58	**89.31**	9.38	19.46	94.41
HZ 1180M C	27.83	7,822.8	**365.3**	352.8	86.90	90.81	**94.73**	9.43	19.59	94.41
HZ 1180M D	28.77	8,124.4	**378.1**	366.5	90.09	94.00	**97.91**	9.47	19.63	94.41

[1] Values taking the intermediary sheet piles into account.

Section	Properties per foot of wall[1]							Per system		
	A	I_y	$W_{el.y}$ *	$W_{el.y}$ **	$G_{60\%}$	$G_{80\%}$	$G_{100\%}$	A_{LW}	A_{LS}	b_{sys}
	in²/ft	in⁴/ft	in³/ft	in³/ft	lb/ft²	lb/ft²	lb/ft²	ft²/ft	ft²/ft	in

Combination HZ ... M - 12 / AZ 18-700

Section	A	I_y	$W_{el.y}$ *	$W_{el.y}$ **	$G_{60\%}$	$G_{80\%}$	$G_{100\%}$	A_{LW}	A_{LS}	b_{sys}
HZ 630M	13.61	1,178.6	**88.0**	98.6	38.30	42.31	**46.33**	8.00	14.38	74.41
HZ 880M A	13.05	1,784.1	**101.5**	115.9	36.54	40.48	**44.42**	8.13	15.93	75.87
HZ 880M B	13.83	1,919.5	**109.7**	123.3	39.20	43.13	**47.06**	8.14	15.94	75.87
HZ 880M C	14.18	2,011.5	**114.8**	128.7	40.40	44.34	**48.27**	8.13	15.94	75.87
HZ 1080M A	14.85	3,222.2	**143.1**	160.5	42.64	46.59	**50.53**	8.11	17.42	75.87
HZ 1080M B	15.41	3,469.4	**154.1**	171.8	44.57	48.51	**52.46**	8.12	17.42	75.87
HZ 1080M C	16.43	3,767.0	**167.6**	185.1	48.03	51.97	**55.91**	8.12	17.43	75.87
HZ 1080M D	17.25	4,057.4	**180.1**	198.4	50.84	54.78	**58.72**	8.12	17.43	75.87
HZ 1180M A	17.91	4,275.6	**189.1**	208.2	53.08	57.02	**60.96**	8.12	17.43	75.87
HZ 1180M B	18.33	4,467.2	**197.6**	216.7	54.51	58.45	**62.39**	8.13	17.45	75.87
HZ 1180M C	19.15	4,748.3	**208.7**	229.9	57.14	61.15	**65.16**	8.17	17.48	75.87
HZ 1180M D	19.79	4,969.4	**219.1**	238.8	59.34	63.35	**67.36**	8.19	17.49	75.87

Combination HZ ... M - 14 / AZ 18-700

Section	A	I_y	$W_{el.y}$ *	$W_{el.y}$ **	$G_{60\%}$	$G_{80\%}$	$G_{100\%}$	A_{LW}	A_{LS}	b_{sys}
HZ 630M	14.53	1,324.2	**109.1**	99.9	40.05	44.75	**49.45**	8.00	15.30	74.41
HZ 880M A	13.96	2,039.4	**128.7**	118.6	38.29	42.90	**47.51**	8.13	16.71	75.87
HZ 880M B	14.73	2,170.0	**136.3**	126.2	40.92	45.52	**50.13**	8.14	16.72	75.87
HZ 880M C	15.08	2,261.1	**141.4**	131.5	42.13	46.73	**51.33**	8.13	16.71	75.87
HZ 1080M A	15.76	3,649.0	**176.7**	165.8	44.40	49.02	**53.64**	8.11	18.20	75.87
HZ 1080M B	16.32	3,889.8	**187.3**	176.8	46.30	50.91	**55.53**	8.12	18.20	75.87
HZ 1080M C	17.33	4,183.9	**200.4**	190.2	49.75	54.37	**58.98**	8.12	18.20	75.87
HZ 1080M D	18.16	4,472.0	**212.6**	203.3	52.57	57.18	**61.79**	8.12	18.21	75.87
HZ 1180M A	18.81	4,688.2	**221.2**	213.4	54.80	59.41	**64.02**	8.12	18.21	75.87
HZ 1180M B	19.20	4,864.7	**228.7**	221.2	56.14	60.75	**65.36**	8.13	18.21	75.87
HZ 1180M C	20.27	5,254.5	**244.5**	236.1	59.28	64.13	**68.98**	8.17	18.32	75.87
HZ 1180M D	20.86	5,443.9	**252.4**	244.7	61.28	66.13	**70.98**	8.19	18.35	75.87

Combination HZ ... M - 24 / AZ 18-700

Section	A	I_y	$W_{el.y}$ *	$W_{el.y}$ **	$G_{60\%}$	$G_{80\%}$	$G_{100\%}$	A_{LW}	A_{LS}	b_{sys}
HZ 630M	18.02	1,744.7	**136.0**	125.1	54.80	58.06	**61.33**	9.59	16.03	91.50
HZ 880M A	16.99	2,699.9	**160.8**	148.8	51.50	54.66	**57.82**	9.84	17.71	94.41
HZ 880M B	18.22	2,909.5	**173.4**	161.1	55.70	58.85	**62.01**	9.86	17.73	94.41
HZ 880M C	18.79	3,056.3	**181.6**	169.6	57.63	60.79	**63.95**	9.86	17.73	94.41
HZ 1080M A	19.90	5,004.9	**231.1**	217.5	61.37	64.54	**67.71**	9.82	19.19	94.41
HZ 1080M B	20.79	5,393.2	**248.3**	234.9	64.42	67.59	**70.76**	9.82	19.19	94.41
HZ 1080M C	22.42	5,865.0	**269.6**	256.4	69.95	73.11	**76.28**	9.83	19.21	94.41
HZ 1080M D	23.74	6,327.7	**289.6**	277.4	74.45	77.61	**80.78**	9.84	19.21	94.41
HZ 1180M A	24.79	6,674.2	**303.9**	293.1	78.03	81.19	**84.35**	9.84	19.21	94.41
HZ 1180M B	25.42	6,958.2	**316.0**	305.9	80.17	83.34	**86.50**	9.85	19.24	94.41
HZ 1180M C	26.81	7,454.7	**336.9**	325.7	84.80	88.02	**91.24**	9.91	19.29	94.41
HZ 1180M D	27.75	7,757.2	**349.8**	339.4	88.00	91.21	**94.42**	9.95	19.32	94.41

Combination HZ ... M - 26 / AZ 18-700

Section	A	I_y	$W_{el.y}$ *	$W_{el.y}$ **	$G_{60\%}$	$G_{80\%}$	$G_{100\%}$	A_{LW}	A_{LS}	b_{sys}
HZ 630M	18.84	1,869.2	**154.1**	141.1	56.47	60.29	**64.11**	9.59	16.89	91.50
HZ 880M A	17.78	2,913.0	**184.0**	169.5	53.11	56.82	**60.52**	9.84	18.42	94.41
HZ 880M B	19.01	3,121.2	**196.2**	181.6	57.31	61.01	**64.70**	9.86	18.44	94.41
HZ 880M C	19.58	3,267.5	**204.4**	190.1	59.25	62.94	**66.64**	9.86	18.44	94.41
HZ 1080M A	20.69	5,363.3	**259.9**	243.9	62.99	66.71	**70.42**	9.82	19.90	94.41
HZ 1080M B	21.59	5,750.7	**277.1**	261.5	66.04	69.75	**73.47**	9.82	19.91	94.41
HZ 1080M C	23.21	6,220.4	**298.1**	282.9	71.57	75.28	**78.98**	9.83	19.92	94.41
HZ 1080M D	24.53	6,681.8	**317.8**	303.9	76.07	79.77	**83.48**	9.84	19.92	94.41
HZ 1180M A	25.58	7,027.4	**331.8**	319.6	79.65	83.35	**87.05**	9.84	19.93	94.41
HZ 1180M B	26.21	7,310.9	**343.9**	332.5	81.79	85.49	**89.19**	9.85	19.94	94.41
HZ 1180M C	27.80	7,892.9	**368.6**	356.0	86.83	90.72	**94.61**	9.91	20.06	94.41
HZ 1180M D	28.74	8,194.5	**381.3**	369.6	90.02	93.91	**97.80**	9.95	20.10	94.41

1) Values taking the intermediary sheet piles into account.

Section	Properties per foot of wall[1]							Per system		
	A	I_y	$W_{el.y}$ *	$W_{el.y}$ **	$G_{60\%}$	$G_{80\%}$	$G_{100\%}$	A_{LW}	A_{LS}	b_{sys}
	in²/ft	in⁴/ft	in³/ft	in³/ft	lb/ft²	lb/ft²	lb/ft²	ft²/ft	ft²/ft	in

Combination HZ ... M - 12 / AZ 20-700

Section	A	I_y	$W_{el.y}$ *	$W_{el.y}$ **	$G_{60\%}$	$G_{80\%}$	$G_{100\%}$	A_{LW}	A_{LS}	b_{sys}
HZ 630M	14.06	1,195.7	**89.3**	100.0	39.21	43.53	**47.85**	8.00	14.38	74.41
HZ 880M A	13.49	1,800.9	**102.4**	117.0	37.44	41.67	**45.91**	8.13	15.93	75.87
HZ 880M B	14.27	1,936.2	**110.7**	124.4	40.09	44.32	**48.55**	8.14	15.94	75.87
HZ 880M C	14.62	2,028.2	**115.8**	129.8	41.30	45.53	**49.76**	8.13	15.94	75.87
HZ 1080M A	15.29	3,239.0	**143.9**	161.4	43.54	47.79	**52.03**	8.11	17.42	75.87
HZ 1080M B	15.85	3,486.2	**154.8**	172.7	45.47	49.71	**53.95**	8.12	17.42	75.87
HZ 1080M C	16.87	3,783.8	**168.3**	186.0	48.93	53.16	**57.40**	8.12	17.43	75.87
HZ 1080M D	17.69	4,074.2	**180.9**	199.2	51.74	55.97	**60.21**	8.12	17.43	75.87
HZ 1180M A	18.35	4,292.4	**189.9**	209.0	53.98	58.21	**62.45**	8.12	17.43	75.87
HZ 1180M B	18.77	4,484.0	**198.4**	217.5	55.41	59.64	**63.88**	8.13	17.45	75.87
HZ 1180M C	19.58	4,765.1	**209.4**	230.7	58.03	62.34	**66.65**	8.17	17.48	75.87
HZ 1180M D	20.23	4,986.2	**219.8**	239.6	60.24	64.54	**68.85**	8.19	17.49	75.87

Combination HZ ... M - 14 / AZ 20-700

Section	A	I_y	$W_{el.y}$ *	$W_{el.y}$ **	$G_{60\%}$	$G_{80\%}$	$G_{100\%}$	A_{LW}	A_{LS}	b_{sys}
HZ 630M	14.98	1,341.4	**110.5**	101.2	40.97	45.97	**50.98**	8.00	15.30	74.41
HZ 880M A	14.40	2,056.2	**129.8**	119.6	39.19	44.09	**49.00**	8.13	16.71	75.87
HZ 880M B	15.17	2,186.8	**137.4**	127.2	41.82	46.72	**51.62**	8.14	16.72	75.87
HZ 880M C	15.52	2,277.9	**142.4**	132.5	43.02	47.92	**52.82**	8.13	16.71	75.87
HZ 1080M A	16.20	3,665.8	**177.5**	166.6	45.30	50.22	**55.13**	8.11	18.20	75.87
HZ 1080M B	16.76	3,906.6	**188.1**	177.6	47.19	52.11	**57.03**	8.12	18.20	75.87
HZ 1080M C	17.77	4,200.7	**201.2**	190.9	50.65	55.56	**60.47**	8.12	18.20	75.87
HZ 1080M D	18.59	4,488.8	**213.4**	204.1	53.46	58.37	**63.28**	8.12	18.21	75.87
HZ 1180M A	19.25	4,705.0	**222.0**	214.1	55.70	60.61	**65.51**	8.12	18.21	75.87
HZ 1180M B	19.64	4,881.5	**229.5**	221.9	57.04	61.94	**66.85**	8.13	18.21	75.87
HZ 1180M C	20.71	5,271.3	**245.2**	236.9	60.17	65.32	**70.47**	8.17	18.32	75.87
HZ 1180M D	21.29	5,460.6	**253.2**	245.5	62.17	67.32	**72.47**	8.19	18.35	75.87

Combination HZ ... M - 24 / AZ 20-700

Section	A	I_y	$W_{el.y}$ *	$W_{el.y}$ **	$G_{60\%}$	$G_{80\%}$	$G_{100\%}$	A_{LW}	A_{LS}	b_{sys}
HZ 630M	18.38	1,758.6	**137.1**	126.1	55.54	59.05	**62.56**	9.59	16.03	91.50
HZ 880M A	17.34	2,713.4	**161.6**	149.6	52.22	55.62	**59.02**	9.84	17.71	94.41
HZ 880M B	18.57	2,923.0	**174.2**	161.9	56.41	59.81	**63.21**	9.86	17.73	94.41
HZ 880M C	19.14	3,069.7	**182.4**	170.3	58.35	61.75	**65.14**	9.86	17.73	94.41
HZ 1080M A	20.25	5,018.4	**231.7**	218.0	62.09	65.50	**68.92**	9.82	19.19	94.41
HZ 1080M B	21.15	5,406.7	**248.9**	235.5	65.14	68.55	**71.97**	9.82	19.19	94.41
HZ 1080M C	22.77	5,878.5	**270.2**	257.0	70.67	74.08	**77.48**	9.83	19.21	94.41
HZ 1080M D	24.09	6,341.2	**290.2**	278.0	75.17	78.57	**81.98**	9.84	19.21	94.41
HZ 1180M A	25.14	6,687.7	**304.5**	293.7	78.75	82.15	**85.55**	9.84	19.21	94.41
HZ 1180M B	25.77	6,971.7	**316.6**	306.5	80.89	84.29	**87.70**	9.85	19.24	94.41
HZ 1180M C	27.16	7,468.1	**337.5**	326.3	85.52	88.98	**92.43**	9.91	19.29	94.41
HZ 1180M D	28.10	7,770.6	**350.4**	340.0	88.71	92.17	**95.62**	9.95	19.32	94.41

Combination HZ ... M - 26 / AZ 20-700

Section	A	I_y	$W_{el.y}$ *	$W_{el.y}$ **	$G_{60\%}$	$G_{80\%}$	$G_{100\%}$	A_{LW}	A_{LS}	b_{sys}
HZ 630M	19.20	1,883.1	**155.3**	142.2	57.21	61.28	**65.35**	9.59	16.89	91.50
HZ 880M A	18.13	2,926.5	**184.9**	170.3	53.83	57.78	**61.72**	9.84	18.42	94.41
HZ 880M B	19.36	3,134.6	**197.1**	182.4	58.03	61.96	**65.90**	9.86	18.44	94.41
HZ 880M C	19.93	3,280.9	**205.3**	190.9	59.97	63.90	**67.83**	9.86	18.44	94.41
HZ 1080M A	21.05	5,376.9	**260.6**	244.5	63.71	67.67	**71.62**	9.82	19.90	94.41
HZ 1080M B	21.94	5,764.2	**277.8**	262.1	66.76	70.72	**74.67**	9.82	19.91	94.41
HZ 1080M C	23.56	6,233.9	**298.7**	283.5	72.29	76.24	**80.18**	9.83	19.92	94.41
HZ 1080M D	24.88	6,695.3	**318.4**	304.5	76.79	80.73	**84.68**	9.84	19.92	94.41
HZ 1180M A	25.93	7,040.8	**332.4**	320.2	80.37	84.31	**88.25**	9.84	19.93	94.41
HZ 1180M B	26.56	7,324.4	**344.5**	333.1	82.51	86.45	**90.39**	9.85	19.94	94.41
HZ 1180M C	28.15	7,906.4	**369.2**	356.6	87.55	91.68	**95.81**	9.91	20.06	94.41
HZ 1180M D	29.09	8,207.9	**382.0**	370.2	90.74	94.87	**98.99**	9.95	20.10	94.41

1) Values taking the intermediary sheet piles into account.

Section	Properties per foot of wall[1]							Per system		
	A	I_y	$W_{el.y}$ *	$W_{el.y}$ **	$G_{60\%}$	$G_{80\%}$	$G_{100\%}$	A_{LW}	A_{LS}	b_{sys}
	in²/ft	in⁴/ft	in³/ft	in³/ft	lb/ft²	lb/ft²	lb/ft²	ft²/ft	ft²/ft	in

Combination HZ ... M - 12 / AZ 26-700

Section	A	I_y	$W_{el.y}$ *	$W_{el.y}$ **	$G_{60\%}$	$G_{80\%}$	$G_{100\%}$	A_{LW}	A_{LS}	b_{sys}
HZ 630M	15.29	1,297.5	**96.9**	108.5	41.72	46.88	**52.04**	8.24	14.62	74.41
HZ 880M A	14.70	1,900.6	**108.1**	123.4	39.90	44.96	**50.02**	8.37	16.18	75.87
HZ 880M B	15.47	2,035.9	**116.4**	130.8	42.56	47.61	**52.66**	8.38	16.18	75.87
HZ 880M C	15.83	2,127.9	**121.5**	136.2	43.76	48.81	**53.86**	8.38	16.18	75.87
HZ 1080M A	16.50	3,339.0	**148.3**	166.3	46.01	51.08	**56.15**	8.36	17.67	75.87
HZ 1080M B	17.06	3,586.2	**159.3**	177.6	47.94	53.00	**58.07**	8.36	17.67	75.87
HZ 1080M C	18.08	3,883.7	**172.8**	190.9	51.39	56.45	**61.52**	8.36	17.67	75.87
HZ 1080M D	18.90	4,174.0	**185.3**	204.1	54.20	59.26	**64.32**	8.37	17.67	75.87
HZ 1180M A	19.56	4,392.2	**194.3**	213.9	56.44	61.50	**66.56**	8.37	17.68	75.87
HZ 1180M B	19.98	4,583.8	**202.8**	222.3	57.87	62.93	**67.99**	8.37	17.69	75.87
HZ 1180M C	20.79	4,864.8	**213.8**	235.5	60.50	65.63	**70.75**	8.42	17.72	75.87
HZ 1180M D	21.44	5,085.8	**224.2**	244.4	62.70	67.83	**72.95**	8.44	17.74	75.87

Combination HZ ... M - 14 / AZ 26-700

Section	A	I_y	$W_{el.y}$ *	$W_{el.y}$ **	$G_{60\%}$	$G_{80\%}$	$G_{100\%}$	A_{LW}	A_{LS}	b_{sys}
HZ 630M	16.21	1,443.1	**118.9**	108.9	43.48	49.33	**55.17**	8.24	15.54	74.41
HZ 880M A	15.61	2,156.0	**136.1**	125.4	41.65	47.38	**53.11**	8.37	16.95	75.87
HZ 880M B	16.37	2,286.4	**143.6**	133.0	44.28	50.00	**55.72**	8.38	16.96	75.87
HZ 880M C	16.73	2,377.6	**148.6**	138.3	45.48	51.21	**56.93**	8.38	16.96	75.87
HZ 1080M A	17.41	3,765.8	**182.4**	171.1	47.77	53.51	**59.25**	8.36	18.44	75.87
HZ 1080M B	17.97	4,006.6	**192.9**	182.1	49.66	55.40	**61.14**	8.36	18.44	75.87
HZ 1080M C	18.98	4,300.6	**206.0**	195.5	53.12	58.85	**64.59**	8.36	18.45	75.87
HZ 1080M D	19.80	4,588.7	**218.1**	208.6	55.93	61.66	**67.39**	8.37	18.45	75.87
HZ 1180M A	20.46	4,804.8	**226.7**	218.7	58.17	63.89	**69.62**	8.37	18.45	75.87
HZ 1180M B	20.85	4,981.3	**234.2**	226.5	59.50	65.23	**70.96**	8.37	18.46	75.87
HZ 1180M C	21.91	5,371.0	**249.9**	241.4	62.64	68.61	**74.58**	8.42	18.57	75.87
HZ 1180M D	22.50	5,560.3	**257.8**	249.9	64.64	70.60	**76.57**	8.44	18.59	75.87

Combination HZ ... M - 24 / AZ 26-700

Section	A	I_y	$W_{el.y}$ *	$W_{el.y}$ **	$G_{60\%}$	$G_{80\%}$	$G_{100\%}$	A_{LW}	A_{LS}	b_{sys}
HZ 630M	19.39	1,841.4	**143.6**	132.1	57.58	61.78	**65.97**	9.83	16.28	91.50
HZ 880M A	18.31	2,793.5	**166.4**	154.0	54.20	58.26	**62.32**	10.09	17.95	94.41
HZ 880M B	19.54	3,003.0	**179.0**	166.3	58.39	62.45	**66.50**	10.11	17.97	94.41
HZ 880M C	20.11	3,149.8	**187.2**	174.7	60.33	64.38	**68.44**	10.11	17.97	94.41
HZ 1080M A	21.22	5,098.9	**235.4**	221.5	64.08	68.15	**72.23**	10.06	19.43	94.41
HZ 1080M B	22.12	5,487.1	**252.6**	239.0	67.13	71.20	**75.28**	10.07	19.44	94.41
HZ 1080M C	23.74	5,958.8	**273.9**	260.5	72.65	76.72	**80.79**	10.08	19.45	94.41
HZ 1080M D	25.06	6,421.4	**293.9**	281.5	77.15	81.22	**85.28**	10.08	19.45	94.41
HZ 1180M A	26.11	6,767.9	**308.1**	297.2	80.73	84.79	**88.85**	10.09	19.46	94.41
HZ 1180M B	26.74	7,051.8	**320.2**	310.0	82.87	86.93	**91.00**	10.10	19.49	94.41
HZ 1180M C	28.13	7,548.1	**341.1**	329.8	87.50	91.61	**95.73**	10.15	19.53	94.41
HZ 1180M D	29.06	7,850.6	**354.0**	343.5	90.69	94.80	**98.91**	10.19	19.56	94.41

Combination HZ ... M - 26 / AZ 26-700

Section	A	I_y	$W_{el.y}$ *	$W_{el.y}$ **	$G_{60\%}$	$G_{80\%}$	$G_{100\%}$	A_{LW}	A_{LS}	b_{sys}
HZ 630M	20.20	1,965.9	**162.1**	148.4	59.25	64.01	**68.76**	9.83	17.13	91.50
HZ 880M A	19.10	3,006.6	**189.9**	175.0	55.81	60.42	**65.02**	10.09	18.67	94.41
HZ 880M B	20.33	3,214.6	**202.1**	187.1	60.01	64.60	**69.19**	10.11	18.69	94.41
HZ 880M C	20.90	3,361.0	**210.3**	195.6	61.94	66.54	**71.13**	10.11	18.69	94.41
HZ 1080M A	22.02	5,457.3	**264.5**	248.2	65.70	70.32	**74.93**	10.06	20.14	94.41
HZ 1080M B	22.91	5,844.6	**281.6**	265.8	68.75	73.37	**77.98**	10.07	20.15	94.41
HZ 1080M C	24.53	6,314.2	**302.6**	287.2	74.27	78.88	**83.49**	10.08	20.16	94.41
HZ 1080M D	25.85	6,775.5	**322.3**	308.2	78.77	83.37	**87.98**	10.08	20.16	94.41
HZ 1180M A	26.90	7,121.0	**336.2**	323.9	82.35	86.95	**91.55**	10.09	20.17	94.41
HZ 1180M B	27.53	7,404.6	**348.3**	336.8	84.49	89.09	**93.69**	10.10	20.18	94.41
HZ 1180M C	29.12	7,986.4	**373.0**	360.2	89.52	94.31	**99.10**	10.15	20.30	94.41
HZ 1180M D	30.06	8,287.9	**385.7**	373.8	92.71	97.50	**102.29**	10.19	20.35	94.41

[1] Values taking the intermediary sheet piles into account.

Section	Properties per foot of wall[1]							Per system		
	A	I_y	$W_{el.y}$ *	$W_{el.y}$ **	$G_{60\%}$	$G_{80\%}$	$G_{100\%}$	A_{LW}	A_{LS}	b_{sys}
	in²/ft	in⁴/ft	in³/ft	in³/ft	lb/ft²	lb/ft²	lb/ft²	ft²/ft	ft²/ft	in

Combination HZ ... M - 12 / AZ 18-10/10

HZ 630M	14.79	1,238.9	**92.5**	103.6	41.54	45.94	**50.34**	7.52	13.90	68.90
HZ 880M A	14.16	1,890.5	**107.5**	122.8	39.58	43.89	**48.19**	7.64	15.45	70.35
HZ 880M B	15.00	2,036.3	**116.4**	130.8	42.44	46.74	**51.04**	7.65	15.46	70.35
HZ 880M C	15.38	2,135.5	**121.9**	136.7	43.74	48.04	**52.34**	7.65	15.46	70.35
HZ 1080M A	16.10	3,441.7	**152.9**	171.4	46.17	50.48	**54.80**	7.63	16.94	70.35
HZ 1080M B	16.71	3,708.3	**164.7**	183.7	48.24	52.56	**56.87**	7.63	16.94	70.35
HZ 1080M C	17.80	4,028.9	**179.3**	198.0	51.97	56.28	**60.59**	7.64	16.95	70.35
HZ 1080M D	18.69	4,341.9	**192.8**	212.3	55.00	59.31	**63.61**	7.64	16.95	70.35
HZ 1180M A	19.40	4,577.1	**202.5**	222.9	57.42	61.72	**66.02**	7.64	16.95	70.35
HZ 1180M B	19.85	4,783.7	**211.6**	232.0	58.96	63.26	**67.57**	7.65	16.96	70.35
HZ 1180M C	20.73	5,086.6	**223.5**	246.2	61.79	66.17	**70.55**	7.69	16.99	70.35
HZ 1180M D	21.43	5,324.8	**234.7**	255.9	64.16	68.54	**72.92**	7.71	17.01	70.35

Combination HZ ... M - 14 / AZ 18-10/10

HZ 630M	15.78	1,396.2	**115.0**	105.4	43.44	48.58	**53.71**	7.52	14.82	68.90
HZ 880M A	15.14	2,165.8	**136.7**	125.9	41.47	46.50	**51.52**	7.64	16.22	70.35
HZ 880M B	15.97	2,306.4	**144.9**	134.1	44.30	49.32	**54.34**	7.65	16.23	70.35
HZ 880M C	16.35	2,404.7	**150.3**	139.9	45.60	50.62	**55.64**	7.65	16.23	70.35
HZ 1080M A	17.08	3,902.0	**189.0**	177.3	48.06	53.10	**58.14**	7.63	17.71	70.35
HZ 1080M B	17.69	4,161.6	**200.4**	189.1	50.11	55.15	**60.19**	7.63	17.72	70.35
HZ 1080M C	18.78	4,478.5	**214.5**	203.6	53.83	58.87	**63.90**	7.64	17.72	70.35
HZ 1080M D	19.66	4,789.1	**227.6**	217.7	56.86	61.89	**66.92**	7.64	17.72	70.35
HZ 1180M A	20.37	5,022.0	**237.0**	228.5	59.27	64.30	**69.33**	7.64	17.73	70.35
HZ 1180M B	20.80	5,212.4	**245.0**	237.0	60.71	65.74	**70.77**	7.65	17.73	70.35
HZ 1180M C	21.94	5,632.4	**262.0**	253.1	64.09	69.38	**74.67**	7.69	17.84	70.35
HZ 1180M D	22.57	5,836.4	**270.6**	262.3	66.25	71.54	**76.82**	7.71	17.86	70.35

Combination HZ ... M - 24 / AZ 18-10/10

HZ 630M	19.25	1,829.3	**142.6**	131.2	58.45	61.98	**65.50**	9.11	15.55	85.98
HZ 880M A	18.11	2,840.8	**169.2**	156.6	54.83	58.23	**61.64**	9.36	17.23	88.90
HZ 880M B	19.42	3,063.1	**182.5**	169.6	59.28	62.68	**66.08**	9.38	17.25	88.90
HZ 880M C	20.02	3,219.0	**191.3**	178.6	61.34	64.73	**68.13**	9.38	17.25	88.90
HZ 1080M A	21.20	5,289.6	**244.2**	229.8	65.33	68.74	**72.16**	9.33	18.71	88.90
HZ 1080M B	22.15	5,702.0	**262.5**	248.3	68.56	71.98	**75.40**	9.34	18.71	88.90
HZ 1080M C	23.88	6,202.5	**285.1**	271.2	74.43	77.84	**81.25**	9.35	18.72	88.90
HZ 1080M D	25.28	6,693.6	**306.3**	293.4	79.21	82.61	**86.02**	9.36	18.73	88.90
HZ 1180M A	26.39	7,061.3	**321.5**	310.1	83.00	86.41	**89.81**	9.36	18.73	88.90
HZ 1180M B	27.06	7,362.9	**334.4**	323.7	85.28	88.69	**92.09**	9.37	18.76	88.90
HZ 1180M C	28.54	7,889.3	**356.5**	344.7	90.19	93.65	**97.11**	9.43	18.80	88.90
HZ 1180M D	29.53	8,210.1	**370.2**	359.2	93.57	97.03	**100.49**	9.47	18.84	88.90

Combination HZ ... M - 26 / AZ 18-10/10

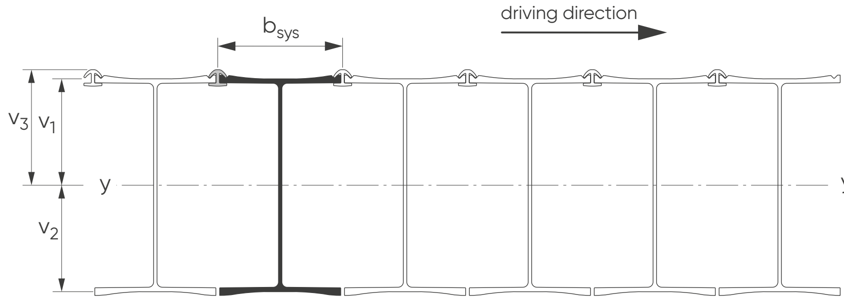
HZ 630M	20.12	1,961.8	**161.7**	148.1	60.23	64.35	**68.46**	9.11	16.41	85.98
HZ 880M A	18.95	3,067.1	**193.8**	178.5	56.55	60.52	**64.50**	9.36	17.94	88.90
HZ 880M B	20.26	3,287.9	**206.7**	191.3	61.00	64.97	**68.94**	9.38	17.96	88.90
HZ 880M C	20.86	3,443.2	**215.4**	200.4	63.05	67.02	**70.99**	9.38	17.96	88.90
HZ 1080M A	22.05	5,670.3	**274.8**	257.9	67.05	71.04	**75.03**	9.33	19.42	88.90
HZ 1080M B	23.00	6,081.7	**293.1**	276.6	70.29	74.28	**78.27**	9.34	19.43	88.90
HZ 1080M C	24.72	6,580.1	**315.3**	299.3	76.15	80.14	**84.12**	9.35	19.44	88.90
HZ 1080M D	26.12	7,069.7	**336.2**	321.5	80.92	84.91	**88.89**	9.36	19.44	88.90
HZ 1180M A	27.23	7,436.3	**351.1**	338.2	84.72	88.70	**92.68**	9.36	19.44	88.90
HZ 1180M B	27.90	7,737.5	**363.9**	351.9	87.00	90.98	**94.95**	9.37	19.45	88.90
HZ 1180M C	29.59	8,354.7	**390.2**	376.8	92.34	96.52	**100.70**	9.43	19.58	88.90
HZ 1180M D	30.58	8,674.5	**403.7**	391.3	95.72	99.90	**104.07**	9.47	19.62	88.90

[1] Values taking the intermediary sheet piles into account.

Section	Properties per foot of wall[1]							Per system		
	A	I_y	$W_{el.y}$ *	$W_{el.y}$ **	$G_{60\%}$	$G_{80\%}$	$G_{100\%}$	A_{LW}	A_{LS}	b_{sys}
	in²/ft	in⁴/ft	in³/ft	in³/ft	lb/ft²	lb/ft²	lb/ft²	ft²/ft	ft²/ft	in
Combination HZ ... M - 12 / AZ 26										
HZ 630M	16.17	1,344.1	**100.4**	112.4	44.35	49.69	**55.02**	7.76	14.14	68.90
HZ 880M A	15.51	1,993.5	**113.4**	129.5	42.33	47.55	**52.78**	7.88	15.69	70.35
HZ 880M B	16.34	2,139.2	**122.3**	137.4	45.19	50.41	**55.62**	7.90	15.70	70.35
HZ 880M C	16.73	2,238.4	**127.8**	143.3	46.49	51.71	**56.92**	7.89	15.70	70.35
HZ 1080M A	17.45	3,544.9	**157.5**	176.6	48.93	54.16	**59.39**	7.87	17.18	70.35
HZ 1080M B	18.06	3,811.5	**169.3**	188.8	51.00	56.23	**61.47**	7.88	17.18	70.35
HZ 1080M C	19.15	4,132.0	**183.8**	203.1	54.73	59.95	**65.18**	7.88	17.19	70.35
HZ 1080M D	20.04	4,445.0	**197.3**	217.3	57.75	62.98	**68.20**	7.88	17.19	70.35
HZ 1180M A	20.75	4,680.1	**207.0**	227.9	60.17	65.39	**70.61**	7.88	17.19	70.35
HZ 1180M B	21.20	4,886.7	**216.2**	237.0	61.71	66.93	**72.15**	7.89	17.21	70.35
HZ 1180M C	22.08	5,189.5	**228.0**	251.2	64.54	69.84	**75.14**	7.93	17.24	70.35
HZ 1180M D	22.77	5,427.7	**239.3**	260.8	66.91	72.21	**77.50**	7.95	17.25	70.35
Combination HZ ... M - 14 / AZ 26										
HZ 630M	17.16	1,501.4	**123.7**	113.3	46.25	52.33	**58.40**	7.76	15.06	68.90
HZ 880M A	16.49	2,268.8	**143.2**	131.9	44.22	50.16	**56.11**	7.88	16.46	70.35
HZ 880M B	17.31	2,409.3	**151.4**	140.1	47.05	52.99	**58.92**	7.90	16.47	70.35
HZ 880M C	17.70	2,507.6	**156.8**	145.8	48.35	54.29	**60.22**	7.89	16.47	70.35
HZ 1080M A	18.44	4,005.2	**194.0**	182.0	50.82	56.78	**62.74**	7.87	17.96	70.35
HZ 1080M B	19.04	4,264.9	**205.4**	193.8	52.87	58.82	**64.78**	7.88	17.96	70.35
HZ 1080M C	20.13	4,581.7	**219.4**	208.3	56.59	62.54	**68.49**	7.88	17.96	70.35
HZ 1080M D	21.01	4,892.1	**232.5**	222.4	59.62	65.56	**71.51**	7.88	17.97	70.35
HZ 1180M A	21.72	5,125.0	**241.8**	233.2	62.03	67.97	**73.92**	7.88	17.97	70.35
HZ 1180M B	22.14	5,315.4	**249.9**	241.6	63.47	69.41	**75.36**	7.89	17.97	70.35
HZ 1180M C	23.29	5,735.4	**266.8**	257.7	66.84	73.05	**79.26**	7.93	18.08	70.35
HZ 1180M D	23.92	5,939.3	**275.4**	267.0	69.00	75.20	**81.40**	7.95	18.10	70.35
Combination HZ ... M - 24 / AZ 26										
HZ 630M	20.35	1,913.6	**149.2**	137.3	60.71	64.98	**69.26**	9.35	15.79	85.98
HZ 880M A	19.18	2,922.3	**174.1**	161.1	57.00	61.14	**65.27**	9.60	17.47	88.90
HZ 880M B	20.48	3,144.5	**187.4**	174.1	61.45	65.58	**69.70**	9.62	17.49	88.90
HZ 880M C	21.08	3,300.3	**196.1**	183.1	63.51	67.63	**71.76**	9.62	17.49	88.90
HZ 1080M A	22.27	5,371.4	**248.0**	233.4	67.51	71.66	**75.80**	9.58	18.95	88.90
HZ 1080M B	23.22	5,783.8	**266.2**	251.9	70.75	74.89	**79.04**	9.58	18.95	88.90
HZ 1080M C	24.94	6,284.2	**288.9**	274.7	76.61	80.75	**84.89**	9.59	18.96	88.90
HZ 1080M D	26.34	6,775.2	**310.1**	297.0	81.38	85.52	**89.65**	9.60	18.97	88.90
HZ 1180M A	27.46	7,142.8	**325.2**	313.7	85.18	89.31	**93.44**	9.60	18.97	88.90
HZ 1180M B	28.13	7,444.4	**338.1**	327.3	87.46	91.59	**95.72**	9.61	19.00	88.90
HZ 1180M C	29.60	7,970.7	**360.2**	348.2	92.36	96.55	**100.73**	9.67	19.05	88.90
HZ 1180M D	30.59	8,291.4	**373.9**	362.8	95.74	99.93	**104.11**	9.71	19.08	88.90
Combination HZ ... M - 26 / AZ 26										
HZ 630M	21.22	2,046.1	**168.7**	154.5	62.48	67.35	**72.22**	9.35	16.65	85.98
HZ 880M A	20.02	3,148.6	**198.9**	183.2	58.72	63.43	**68.13**	9.60	18.18	88.90
HZ 880M B	21.32	3,369.2	**211.8**	196.1	63.17	67.86	**72.56**	9.62	18.20	88.90
HZ 880M C	21.92	3,524.6	**220.5**	205.1	65.22	69.92	**74.61**	9.62	18.20	88.90
HZ 1080M A	23.12	5,752.1	**278.8**	261.6	69.23	73.95	**78.67**	9.58	19.66	88.90
HZ 1080M B	24.07	6,163.5	**297.0**	280.3	72.47	77.19	**81.91**	9.58	19.67	88.90
HZ 1080M C	25.79	6,661.7	**319.2**	303.0	78.33	83.04	**87.75**	9.59	19.68	88.90
HZ 1080M D	27.19	7,151.3	**340.1**	325.3	83.10	87.81	**92.52**	9.60	19.68	88.90
HZ 1180M A	28.30	7,517.8	**354.9**	341.9	86.90	91.60	**96.30**	9.60	19.69	88.90
HZ 1180M B	28.97	7,819.0	**367.8**	355.6	89.18	93.88	**98.58**	9.61	19.70	88.90
HZ 1180M C	30.65	8,436.0	**394.0**	380.5	94.51	99.42	**104.32**	9.67	19.82	88.90
HZ 1180M D	31.64	8,755.8	**407.5**	394.9	97.89	102.79	**107.69**	9.71	19.86	88.90

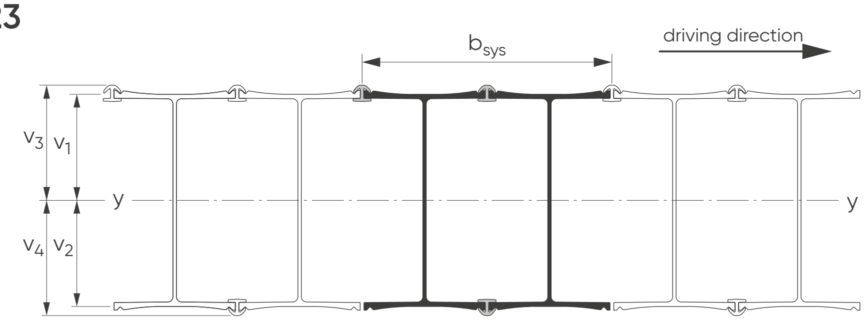
[1] Values taking the intermediary sheet piles into account.

Combination C 1



Section	Dimensions			Properties per foot of wall					Per system		
	v_1	v_2	v_3	A	G	I_y	$W_{el,y}$*	$W_{el,y}$**	A_{LW}	A_{LS}	b_{sys}
	in	in	in	in²/ft	lb/ft²	in⁴/ft	in³/ft	in³/ft	ft²/ft	ft²/ft	in
HZ 630M	11.52	12.72	12.63	35.78	**121.77**	3,971.6	**312.1**	314.3	1.68	8.20	17.09
HZ 880M A	14.97	16.66	16.32	31.70	**107.89**	6,031.4	**362.0**	369.5	1.81	9.79	18.70
HZ 880M B	15.14	16.65	16.42	34.79	**118.40**	6,556.9	**393.9**	399.4	1.82	9.80	18.70
HZ 880M C	15.25	16.70	16.45	36.23	**123.31**	6,928.7	**415.0**	421.3	1.82	9.80	18.70
HZ 1080M A	19.72	21.52	21.07	39.25	**133.58**	11,646.2	**541.2**	552.7	1.79	11.28	18.50
HZ 1080M B	19.90	21.57	21.14	41.58	**141.49**	12,654.9	**586.6**	598.6	1.80	11.28	18.50
HZ 1080M C	20.10	21.61	21.22	45.62	**155.26**	13,825.6	**639.7**	651.7	1.80	11.29	18.50
HZ 1080M D	20.31	21.72	21.27	48.93	**166.53**	14,985.9	**690.1**	704.6	1.80	11.29	18.50
HZ 1180M A	20.50	21.84	21.31	51.55	**175.45**	15,849.3	**725.9**	743.8	1.81	11.29	18.70
HZ 1180M B	20.65	21.85	21.37	53.27	**181.29**	16,625.5	**760.9**	777.9	1.82	11.31	18.70
HZ 1180M C	20.58	22.07	21.34	56.34	**191.75**	17,709.1	**802.2**	829.8	1.83	11.37	18.70
HZ 1180M D	20.78	22.03	21.46	58.89	**200.40**	18,567.9	**842.8**	865.2	1.85	11.39	18.70

Combination C 23



Section	Dimensions				Properties per foot of wall					Per system		
	v_1	v_2	v_3	v_4	A	G	I_y	$W_{el,y}$*	$W_{el,y}$**	A_{LW}	A_{LS}	b_{sys}
	in	in	in	in	in²/ft	lb/ft²	in⁴/ft	in³/ft	in³/ft	ft²/ft	ft²/ft	in
HZ 630M	11.76	12.48	12.88	13.59	36.50	**124.21**	4,080.4	**327.0**	300.1	3.27	9.82	34.17
HZ 880M A	15.32	16.31	16.68	17.67	32.39	**110.23**	6,218.2	**381.3**	352.0	3.53	11.57	37.40
HZ 880M B	15.44	16.34	16.72	17.62	35.45	**120.63**	6,732.9	**412.0**	382.0	3.55	11.59	37.40
HZ 880M C	15.54	16.40	16.74	17.60	36.89	**125.54**	7,104.2	**433.1**	403.5	3.54	11.59	37.40
HZ 1080M A	20.09	21.14	21.45	22.50	39.95	**135.97**	11,964.3	**565.8**	531.8	3.50	13.04	37.01
HZ 1080M B	20.24	21.23	21.48	22.47	42.24	**143.75**	12,954.8	**610.1**	576.5	3.51	13.05	37.01
HZ 1080M C	20.40	21.31	21.52	22.43	46.28	**157.51**	14,122.5	**662.8**	629.7	3.52	13.06	37.01
HZ 1080M D	20.59	21.43	21.55	22.39	49.60	**168.79**	15,280.9	**712.9**	682.3	3.52	13.07	37.01
HZ 1180M A	20.77	21.57	21.57	22.37	52.21	**177.69**	16,141.6	**748.4**	721.5	3.52	13.07	37.40
HZ 1180M B	20.86	21.64	21.59	22.36	53.81	**183.14**	16,862.8	**779.4**	754.1	3.54	13.11	37.40
HZ 1180M C	20.87	21.78	21.63	22.54	57.14	**194.45**	18,058.9	**829.1**	801.2	3.57	13.18	37.40
HZ 1180M D	20.97	21.84	21.65	22.52	59.44	**202.29**	18,800.1	**860.8**	834.8	3.61	13.21	37.40

Designing an HZ®-M Steel Wall System

The design of a combined wall is similar to that of all standard sheet pile walls, but calculating the section properties of a combined HZ/AZ system is undertaken differently to conventional sheet piling.

The combined wall is a combination of different elements with the underlying assumption that the bending moments along the wall are distributed to the different elements proportionally to their stiffness.

Consequently:

- moment of inertia of one HZ/AZ system (one HZ®-M and one pair of AZ):

$$I_{sys} = I_{HZ} + I_{AZ}$$

- moment of inertia of the HZ/AZ system per unit length:

$$I_{sys/m} = \frac{I_{HZ} + I_{AZ}}{b_{sys}}$$

Hence, following formulas allow calculating the bending moment distribution to each single component.

Assuming that M_{sys} is the bending moment per unit length based on the geotechnical design:

- bending moment transmitted to the HZ-M king pile (including the connectors):

$$M_{HZ} = \left(\frac{I_{HZ}}{I_{sys}} M_{sys}\right) b_{sys}$$

- bending moment transmitted to the intermediary AZ sheet pile:

$$M_{AZ} = \left(\frac{I_{AZ}}{I_{sys}} M_{sys}\right) b_{sys}$$

Steel stress verification - Global safety approach

If only the effect of the bending moments is considered, steel stresses can be determined with the basic formula:

$$\sigma = \frac{M}{W}$$

For the HZ-M king piles:

$$\sigma_{HZ} = \frac{M_{HZ}}{W_{HZ}} = \left(\frac{1}{W_{HZ}}\right)\left(\frac{I_{HZ}}{I_{sys}} M_{sys}\right) b_{sys}$$

$$= \frac{1}{W_{HZ,\,eq}} M_{sys}$$

where $$W_{HZ,\,eq} = \frac{I_{sys}}{b_{sys}\, max\left(v_1, v_2\right)}$$

is the "equivalent section modulus" of the HZ-M king pile. This approach simplifies the task of the designer by using exclusively M_{sys} (no need to decompose M_{sys}).

Note: "$W_{HZ,eq}$" is labelled in the tables of this brochure as $W_{el,y}$*.

For the connectors RH / RZD / RZU:

$$\sigma_{RH/RZ} = \frac{M_{HZ}}{W_{RH/RZ}} = \left(\frac{1}{W_{RH/RZ}}\right)\left(\frac{I_{HZ}}{I_{sys}} M_{sys}\right) b_{sys}$$

$$= \frac{1}{W_{RH/RZ,\,eq}} M_{sys}$$

where $$W_{RH/RZ,\,eq} = \frac{I_{sys}}{b_{sys}\, max\left(v_3, v_4\right)}$$

Note: "$W_{RH/RZ,eq}$" is labelled in the tables of this brochure as $W_{el,y}$**.

For the AZ infill sheet piles:

$$\sigma_{AZ} = \frac{M_{AZ}}{W_{AZ}} = \frac{\frac{I_{AZ}}{I_{sys}} M_{sys}\, b_{sys}}{W_{AZ}}$$

Based on the above formulas, the verification of the allowable stresses is straightforward:

$$\sigma_{allowable} = \frac{f_y}{S_F}$$

The steel stresses of each component must be checked individually:

$$\sigma_{HZ} \leq \sigma_{allowable,\ HZ}$$

$$\sigma_{RH/RZ} \leq \sigma_{allowable,\ RH/RZ}$$

$$\sigma_{AZ} \leq \sigma_{allowable,\ AZ}$$

Notes:

- the yield stress of each component may be different. As a rule of thumb, stresses within the infill sheet piles are most often relatively small, allowing the use of a low steel grade for the AZ sections. This improves the cost efficiency of the system. However, driveability issues may trigger the choice of a higher steel grade than required by the design calculations.
- the yield strength of the connectors shall be equal or higher than that of the HZ-M, except for the combination 12. Hence, connectors are available exclusively with a yield strength of 66.7 ksi.
- the full range of HZ-M system are also available in ASTM A690, with yield strengths of 50 ksi and above.

The HZ-M king piles are capable of transferring high vertical loads to the subsoil. In such cases, stress analysis should include vertical loads and additional bending moments induced by deflection. Vertical loads can also originate from battered anchor piles, struts, etc.

The basic formula changes to:

$$\sigma = \frac{M}{W_x} + \frac{N \cdot e}{W_x} + \frac{N}{A_{HZ}}$$

To summarize, the designer can calculate in an easy way the stresses in the different components of the HZ-M by using the bending moment M_{sys} of the combined wall and the two "equivalent" section moduli $W_{el,y}{}^{*}$ and $W_{el,y}{}^{**}$ which are shown in the tables of this brochure.

Steel stress verification - Partial safety approach

In Europe, the design of steel sheet pile walls has to be compliant with the Eurocodes. Please refer to EN 1993 - Part 5 [1] for the complete design method. Eurocodes are based on "partial safety factors" that are applied to the resistances (EN 1993-5) and the actions (geotechnical design based on EN 1997- Part 1 [2]). Recommendations and advice for efficient design of combined steel walls according to the Eurocodes can be found in [12].

Practical aspects

The contribution of the infill sheet piles is relatively small for certain combinations so that in some cases, the designer neglects the contribution of the moment of inertia of the infill sheet piles. This is a safe-sided approach but might be over conservative in some cases.

Savings can be achieved by shortening the length of the intermediary sheet piles. In the ground, where there is earth support and embedment, the length of the intermediary sheet piles can be considerably optimized. In the infill role, the intermediary sheet pile is only required to resist active earth pressures down to the zero earth pressure level. For safety reasons, its length is extended below this level by at least 3.3 to 6.6 ft (Figure 2). If the embedment of the infill sheet pile is quite small, special care must be taken during construction to make sure that the piles are driven to the design level. For cantilever walls, the maximum bending moment occurs in the embedded portion of the piles. Therefore, the length of the infill sheet piles must be checked. Furthermore, if groundwater pressures are high, the risk of seepage beneath the toe should be analysed when optimizing the length of the intermediary sheet piles.

The HZ-M king pile spacing should be limited so that full continuous earth resistance is safeguarded. When determining pile spacing, arching effects of the soil may be considered. If these properties are negligible (e.g. in soft mud or where groundwater pressure is high), the transverse load capacity of the intermediary sheet piles needs to be checked. Additionally, the development of the earth resistance in front of the wall may have to be checked. Experience shows that for the standard HZ/AZ combinations, this 3D effect on the passive resistance can be taken into account, and the design of the combined wall can be done as a continuous retaining wall. More detailed information can be found in Chapter 8.1.4 of the EAU 2012 [3]. The section modulus of the HZ-M king piles can be adapted to the resultant bending moment by adding RH connectors to the rear flanges. As a result, a lighter section can be selected and simply strengthened locally, where maximum bending occurs (Figure 3).

The HZ-M wall system, in which the full range of AZ sections can be used as intermediary sheet piles, offers maximum flexibility in terms of design. Heavier AZ sections can also be selected to enhance corrosion resistance or enhance driving behaviour. Generally speaking, the range of suitable sheet piles varies from 22.3 to 59.5 in³/ft.

Driveability is an additional key factor that should be analysed when choosing the infill sheet piles. In normal driving conditions, infill sheet piles above 65 ft should have a section modulus above 37.2 in³/ft.

Local standards or regulations may call for specific features of the infill sheet piles. For instance, in some countries infill sheet piles used in marine structures shall have a minimum thickness of 0.39 to 0.47 in.

Note:
The application of design methods is to be reviewed in reference to each national standard governing (e.g. contribution of the infill sheet piles to bending resistance [1]).

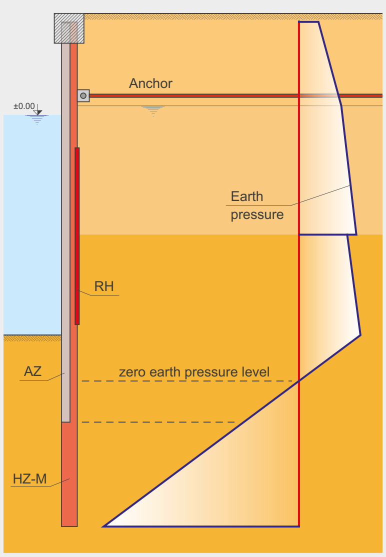


Fig. 2. Optimization of the length of the AZ infill sheet piles.

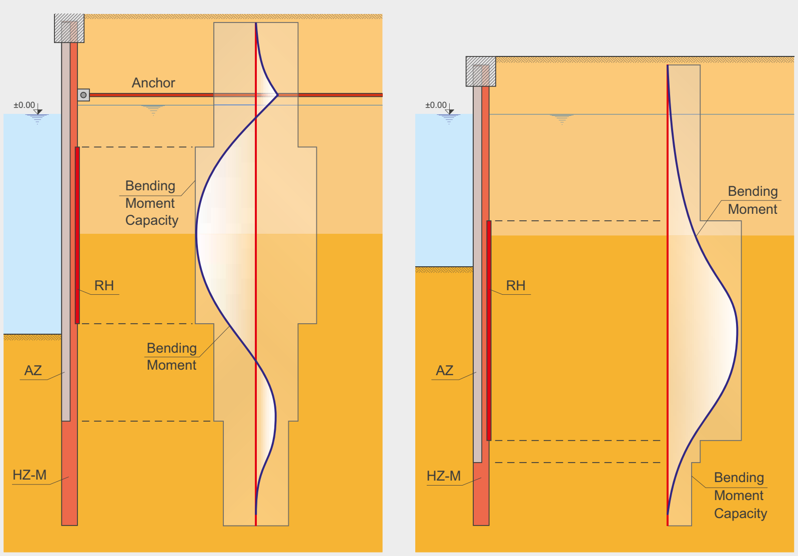


Fig. 3. Optimization of the bending moment capacity with additional RH connectors on the rear flange.

HZ®-M specific tie-back solution

Anchoring an HZ/AZ combined wall system can be simple and efficient: a tie-rod links each HZ-M pile or HZ-M box pile to a steel sheet pile anchor wall or isolated sheet pile panels - a particularly economical solution.

Because each king pile is anchored, a traditional waler system can be avoided. The tie-rod is simply linked to the HZ-M pile through two T-connectors and a pin. T-connectors are threaded through slots cut on jobsite in the rear flange of the HZ-M pile after driving. Loads are thereby applied close to the web.

HZ-M sections can be delivered with precut anchor slots on request, although this is not best practice as it is difficult to achieve the exact elevation of the slots due to driving tolerances. The figure below shows the slots cut in the HZ-M king pile. The dimensions “h” and “b” vary with the tie rod diameter.

Conventional anchoring, incorporating a waler system, is an alternative. The HZ-M system can also be anchored with battered steel HP-piles or with grouted anchors.

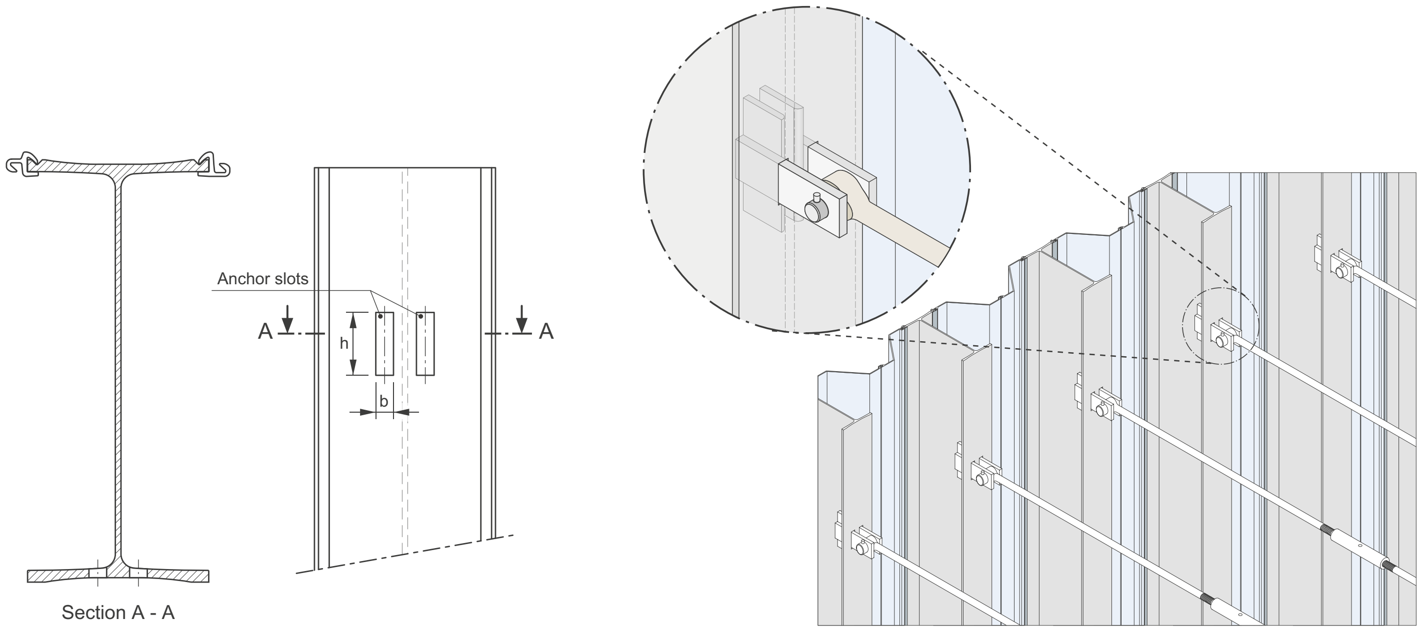


Fig. 4. Special tie-rod connection with T-connector for the HZ-M.

Fig. 5. Installation of the T-connectors at the job-site.

Fig. 6. Conventional anchor solution with tie-rods, walers,...

Installation procedure

The HZ-M Steel Wall System can be installed on land or from water in a similar way. The key element for state-of-the-art installation is pile guiding. The guide can be a 2-level template frame or a leader mast attached to the pile driving machine.

First, the template frame is placed and secured to avoid any shifting during driving. Then a number of HZ-M king piles are pitched in the template. Afterwards, the king piles are driven into the ground (Figure 7 - Step 1), starting preferably with a vibratory hammer, adopting the "Pilgrim's step" driving sequence.

Depending on the soil conditions, the application and the geometry of the final structure, a second driving phase with a sufficiently powered impact hammer may be required (Figure 7 - Step 2): driving to final depth resumes after the removal of the driving template.

Generally, intermediary sheet piles are pitched and driven after the installation of the HZ-M piles is completed (Figure 7 - Step 3).

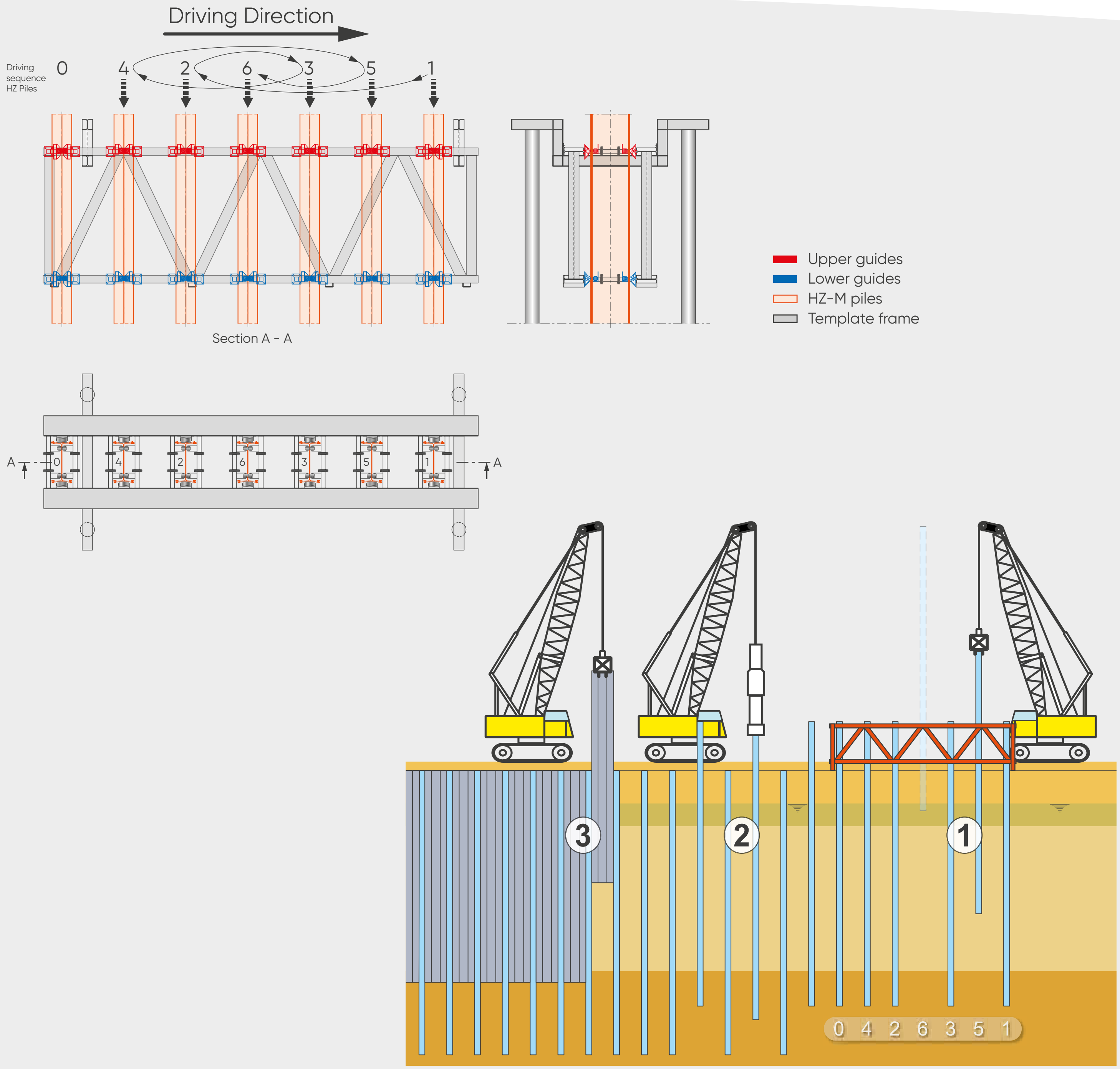
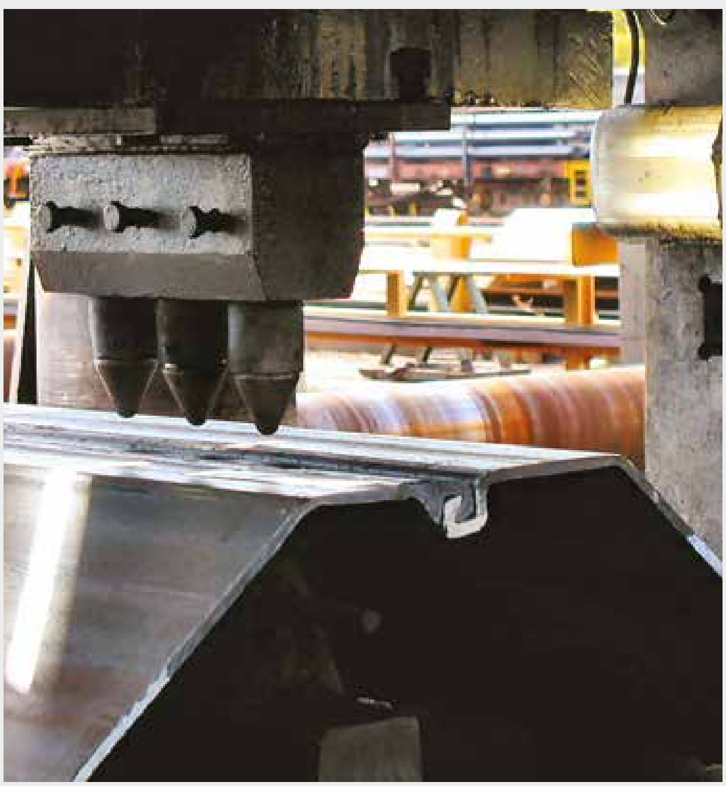


Fig. 7. Installation procedure: driving template and "Pilgrim's step" driving sequence.

In case of difficult geotechnical conditions, the following may be necessary:

- Driving operation in stages: driving of king piles with vibratory hammer until refusal, then switch to impact hammer to reach final installation depth. The use of an impact hammer allows for an assessment of the final bearing capacity.
- Pre-drilling after placing the HZ-M piles may be considered to avoid damages of the infill sheet piles.
- In case vibrations on surrounding structures shall be avoided, placing of the HZ-M piles in a slurry trench may be considered.

It is recommended to use partially crimped pairs of AZ sheet piles: this specific crimping of the interlocks increases the stiffness at the top of the sheet pile and facilitates the installation process (Figure 8). At the bottom, the AZ sheet piles are still "flexible" enough to accommodate the driving tolerances of the king piles. For wide AZ- piles, the use of double clamps is recommended to achieve the best installation performance.



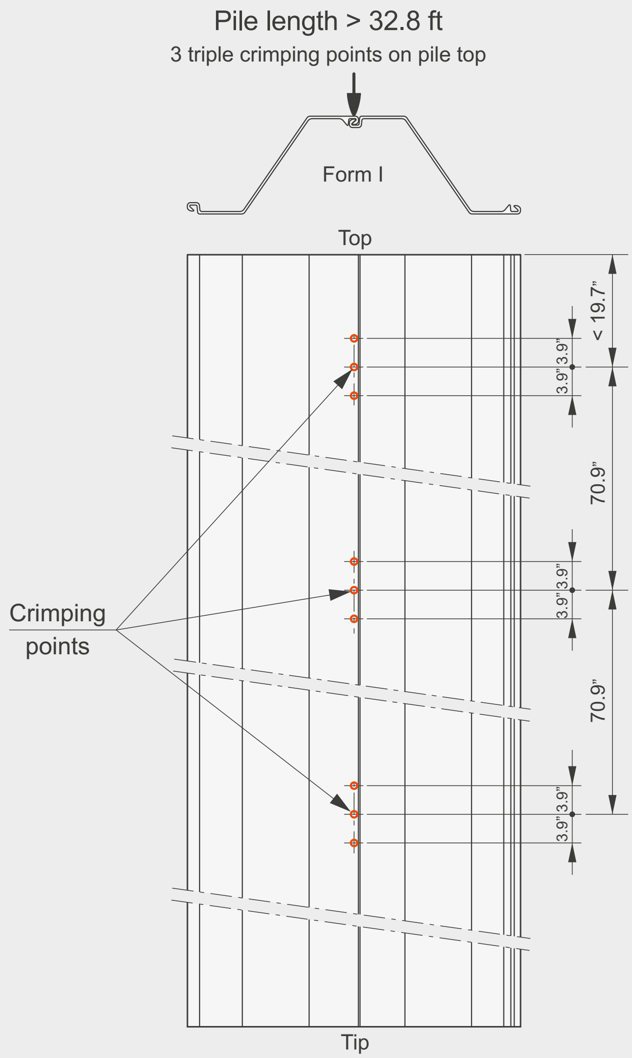


Fig. 8. Special crimping pattern for AZ infill sheet piles and crimping at the rolling mill.

Installation methods

It is essential that king piles are driven in the correct position as per driving plan. Greatest possible accuracy has to be guaranteed on verticality or prescribed batter. Two different methods can be used.

Method 1: Template with two guide levels

A rigid template with two guide levels is used in this method. The template has openings for the theoretical position of the king piles (Figure 9). The vertical distance between the two levels should be 25% of the pile length, but in any case not less than 9.84 ft.

The template should be placed as close to the ground as possible. On land, the template can rest on the ground, but it should be secured firmly against shifting. It is advisable to support the template on separate piles. When driving in water, the template should be supported on auxiliary piles just above the water level.

Depending on the design, templates usually have space for 5 to 9 king piles (Figure 7). These primary piles are driven using a free-hanging vibrator or an impact hammer, the vibrator being the most commonly used equipment. Inside the template, a proper HZ-M guiding system (Figure 10) should be designed to avoid damage to the coating on the sheet piles if applicable (for example, by using guiding rolls).

After all the piles in one template are driven, the template is removed and repositioned. The last driven pile will serve as an anchor pile to guarantee the correct new position of the template. This will ensure proper alignment and distance between the next driven king piles. It may also serve as a support pile.

Later on, the intermediary sheet piles can be installed with the same driving equipment, or by a second pile driving team. For this operation, no template is necessary.

Fig. 9. Driving templates and their support.

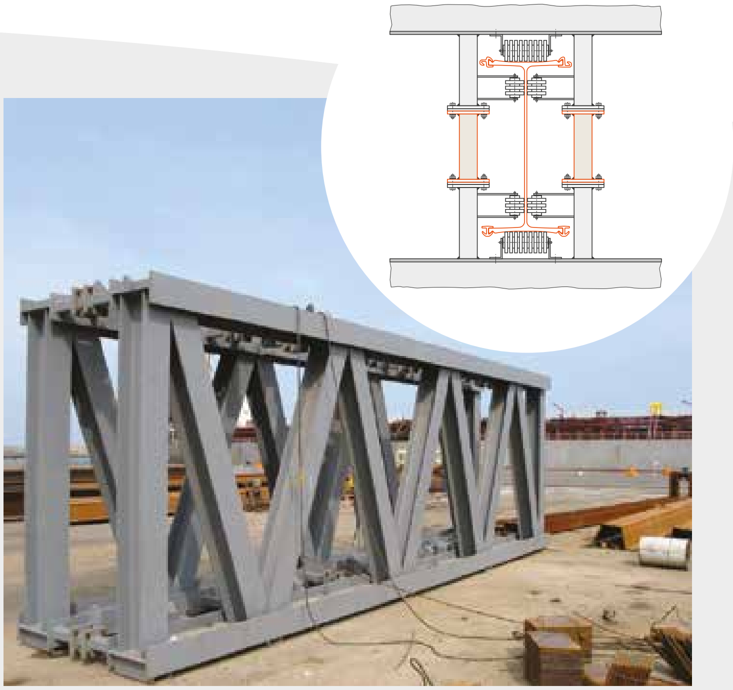


Fig. 10. Template and detail of guide.

Fig. 11. Template with a single level and piling equipment guided on a fixed leader.

Method 2: Fixed leader system

The king piles are driven using piling equipment guided by a fixed leader (Figure 11). The specified verticality or inclination must be achieved by the leader and the correct positioning through a simple horizontal driving frame. When piling in water, the latter is secured above the water level on auxiliary piles. In all other cases, it is set down on the driving planum and fixed in its position.

Underwater installation

The rehabilitation of an existing deck-on-piles (Figure 12) or a gravity structure may be done with an underwater cantilever or anchored sheet pile wall installed in front of the existing structure. The installation of such a wall is more complex, but the procedure is similar to the driving methods described before. There is a need for a guiding system and the driving sequence follows the same principles, but the different phases have to be adapted to the local environment and tidal fluctuations. The driving equipment should be able to work under water, otherwise a vibratory hammer fitted with a "follower" (extension) can be used (Figure 12).

Additional recommendations

It is important to constantly check the position of the king piles and their verticality during the installation process. It should be as close as possible to the theoretical position. The intermediary sheet piles should be designed in the way, that they can compensate for installation tolerances of the king piles and their position without damage. The tolerance compensation can result from interlock rotation (only for AZ-piles), elastic deformation and plastic deformation.

In order to ensure an efficient and damage-free installation of AZ-type intermediary sheet piles, the distance between two adjacent king piles, at any position over the height of the infill sheet pile, should not exceed 7.9 in and, in any case, the distance shall be less than the unfolded width of the intermediary sheet pile. In addition, compatibility with the rotation capacity of the interlocks should be considered. Producer information must be observed.

In case prescribed tolerances are not achieved, the king piles should be extracted and re-driven, or compatibility of the achieved driving tolerances should be proven. In special cases, the contractor can fabricate a special pile which takes into account the existing driving imperfection. It is to be noted that driving tolerances may have an impact on the water pressure resistance of the infill sheet piles and need to be accounted for in the design.

Under certain conditions, more specific attention to the choice of the intermediary sections is recommended. Please contact our Engineering Department for further information.

Generally, tolerances shall be agreed upon before the project starts.

Filling the interlocks of the free RZ connectors before installation with foam, Beltan®Plus or grease will significantly reduce the interlock resistance thus facilitates the pile driving. In case of non-cohesive soils, this procedure is strongly recommended as it prevents soil compacting inside of the interlocks.

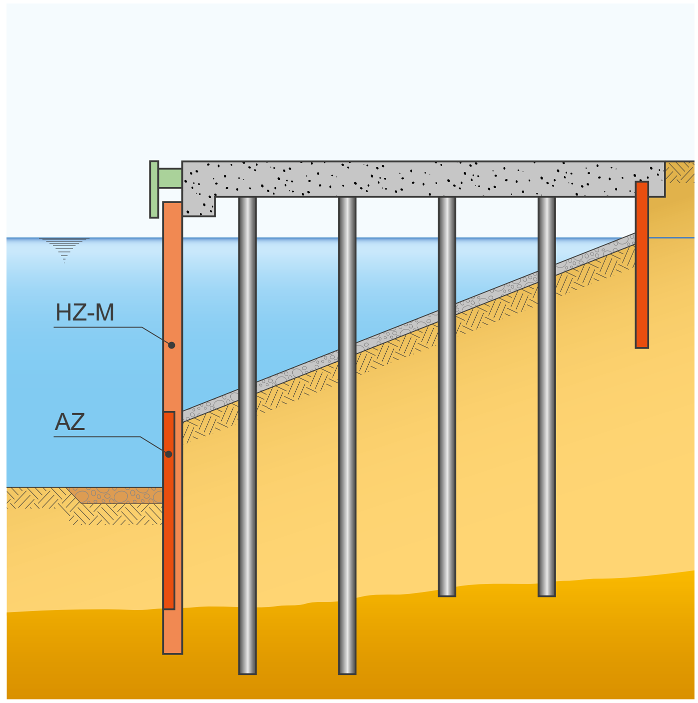


Fig. 12. Installation of AZ below water level with a follower on a vibratory hammer.

Driving equipment

State-of-the-art driving technology allows for the use of impact or vibratory equipment to drive king piles and intermediary sheet piles. Vibratory equipment should be preferred whenever possible. A combination of the two methods can be used for the driving of the king piles: the king piles are first driven using vibration techniques. The final depth is reached with an impact hammer, also to allow for a first assessment of the bearing capacity.

Intermediary sheet piles are generally installed with vibratory hammers. Vibratory hammers should be fitted with adequate clamps to ensure a correct energy transfer to the pile during the driving process. It is recommended to use double clamps for HZ-M box piles. For intermediary AZ sheet piles, single or double clamps can be considered (Figure 13). It is advisable to choose a vibrator with sufficient power reserve to allow for good driving speed and penetration, as well as to prevent damaging the interlocks through overheating. Vibratory hammers with variable moment are preferable. The different types of impact hammers are free-fall hammers, diesel hammers, and hydraulic hammers.

A driving cap must be used with free-fall or diesel hammers (Figure 14). In the case of an hydraulic hammer, the manufacturer can provide special driving plates which fit the geometry of the pile head. Note that impact hammers should be powerful enough to avoid local deformation of the pile heads.

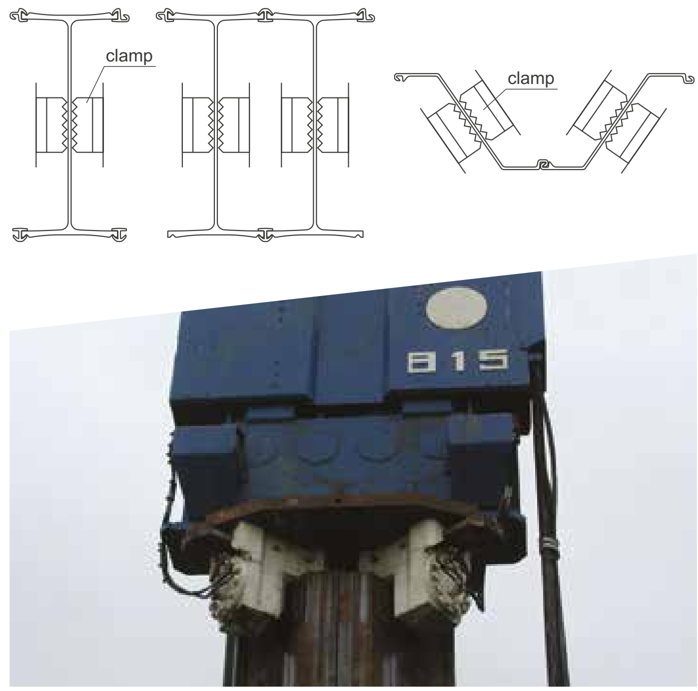


Fig. 13. Double clamps for a vibratory hammer.

Position of section HZ 880M / 1080M / 1180M as solution 26

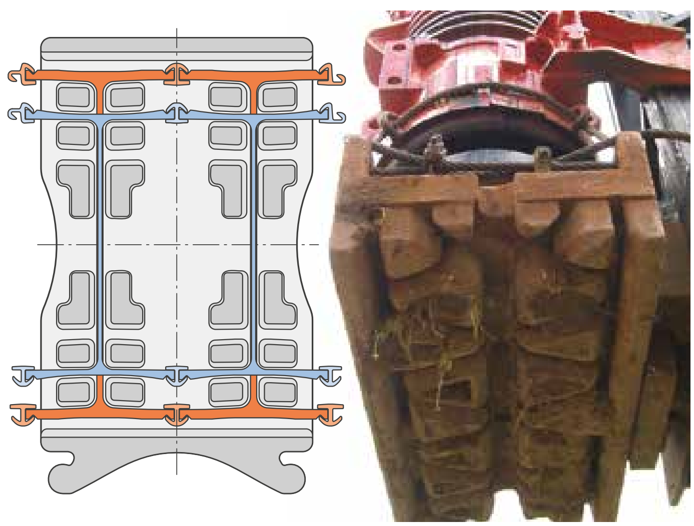


Fig. 14. Impact hammer driving cap.

If driving of the intermediary sheet piles shows no progress, is impossible or can only be achieved through excessive driving energy, the following is advised:

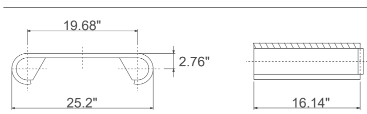
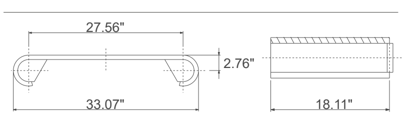
- check for obstructions in the soil. This can be done, for example, by extracting the intermediary sheet pile and re-driving it outside the interlocks.
- verify that the spacing and the positioning of the king piles is correct. This can be done, for example, by means of an inclinometer. A tube of the same diameter as the inclinometer is fitted with a corresponding connector and jetted down on the interlocks at the back flange of the king pile. The measurements taken by the inclinometer will give information on the actual position of the king pile at the relevant depths. In case the spacing between the king piles does not comply with the driving tolerances requirements, the king piles must be extracted and re-driven.

It is strongly advised to avoid forcing the driving of an intermediary sheet pile, as this might lead to interlock damage.

Sheet pile sections and corresponding driving caps

Arrangement	Single pile	Double pile
Driving caps	HS 8-11	HD 6-11
HZ®-M sections		
HZ 630M	✓ 1)	✓ 1)
HZ 880M	✓	✓
HZ 1080M	✓	✓
HZ 1180M	✓	✓

1) On request.

Dimensions of relevant sliding guides	Designation	Corresponding driving caps
	500/90	HS 8-11
	700/90	HD 6-11

Driving aids

Whenever difficult driving is expected due to unfavourable geotechnical conditions, auxiliary techniques can help to smooth the progress of driving:

- water jetting: mainly in compact granular or slightly cohesive soils
- pre-drilling
- reinforcing the pile toe
- blasting
- installation in slurry trench.

Water jetting in compact granular or slightly cohesive soil

Water jetting tubes attached to the intermediary sheet piles might facilitate the driving. A pressure of approximately 10 - 20 bars yields good results through minimizing the friction along the sheet pile surface and reducing toe resistance. Installation time, necessary driving energy, and vibrations are drastically reduced.

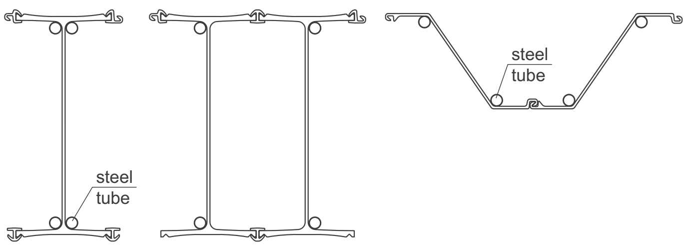


Fig. 15. Water jetting.

Pre-drilling / Augering

Pre-drilling or augering is often used when sheet piles are to be driven into compact sands or stiff clays. The aim is to loosen the soil, in some cases even soil replacement can be foreseen, so that driving can be performed with standard piling equipment.

Pre-drilling can also be used when the combined wall has to penetrate rock layers. In this case, only the HZ-M king piles are driven into the drilled space in the soil layer (Figure 16).

Generally, pre-drilling is done only for the intermediary piles. The drilling diameter can be chosen in the range of 30%-40% of the sheet pile width.

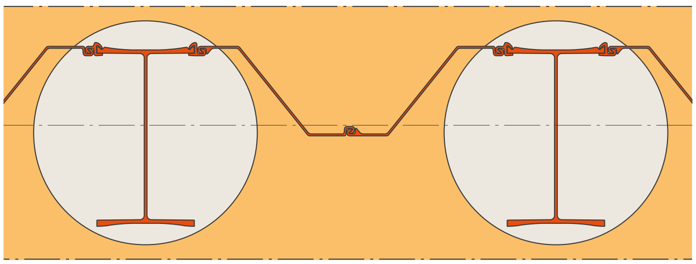


Fig. 16. Pre-drilling / augering for king piles.

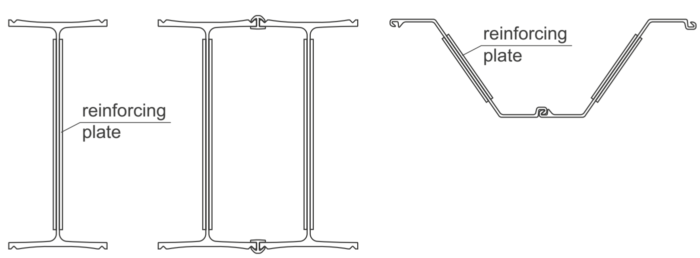
Fig. 17. Reinforcing of the tip of the pile with steel plates / shoes welded on the king pile toe.

Reinforcing of the pile toe

Piles can be strengthened by welding steel plates at the tip of the pile. This is used predominantly in cohesive soils with the aim of reducing skin friction (Figure 17).

Alternatively, the whole toe of the pile can be equipped with special cast elements also called "tip points" or "pile shoes". This allows the pile to penetrate into rock, up to a few meters (for instance in sandstone or mudstone), without damage.

For the HZ-M king piles, a special toe-cutting can be foreseen to concentrate the driving energy at the toe of the pile and cut through the hard soil layers (Figure 17). For AZ piles, simple plates can be sufficient as reinforcement.



Rock bolting / Toe pinning into a rock layer

If the rock layer is higher than the required embedment depth of the combined wall, then the bottom of the wall can be secured by dowelling the king pile to the underlying rock (toe-pin, see Figure 18). Please consult the specific brochure for more information.

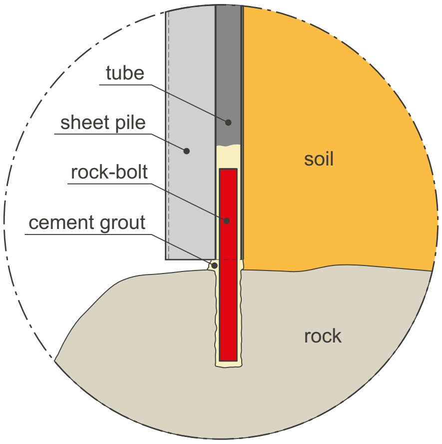


Fig. 18. Concept of a rock-bolt.

Durability

Generally, when designing temporary structures, corrosion does not have to be considered. For permanent structures, however, corrosion impact has to be analyzed for the service life. The loss of steel has an influence on the design of structures executed in marine environments. Atmospheric corrosion is quite small, and in most natural soils, steel resists quite well to the phenomenon of corrosion.

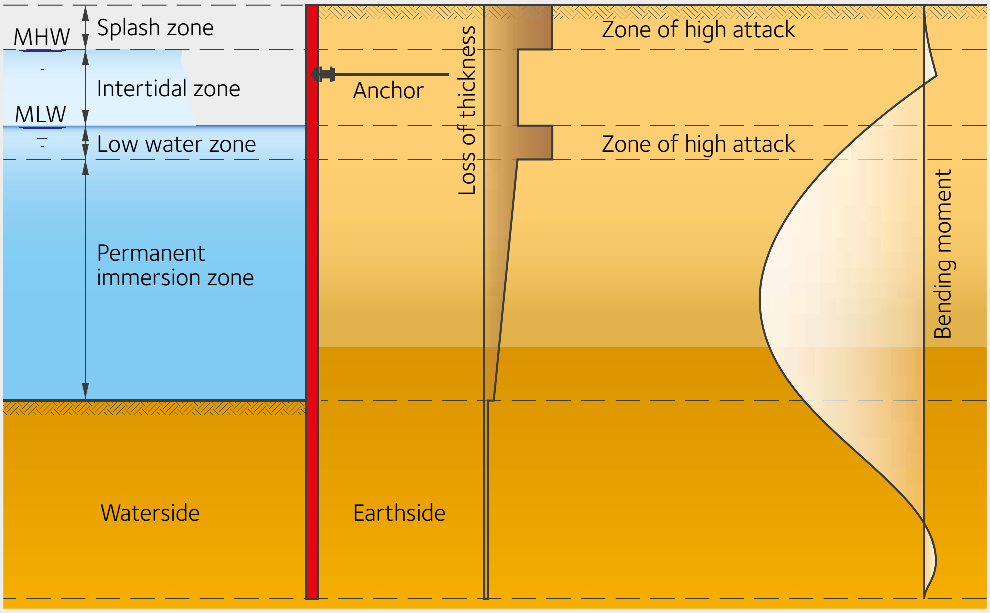
The determination of the residual section properties after corrosion of an HZ-M Steel Wall System is more complex than for standard sheet piles because corrosion is higher on the water side of the wall. Assumptions like proportionality to the initial thickness of the flange are too conservative and may lead to uneconomic solutions. Please contact our technical department if you need an assessment of the residual section properties.

Additional protection methods of the steel include surface coatings, cathodic protection (only in the zone which is permanently in contact with water), concrete capping beams, etc.

ArcelorMittal has developed a new steel grade **AMLoCor®** that is more resistant to corrosion in the "Permanent Immersion Zone" and in the "Low Water Zone". In the near future, all the elements of the HZ-M system will be available in AMLoCor steel grade with different yield strengths.

ArcelorMittal's technical department can assist with any queries.

Example for typical loss of thickness due to corrosion and moment distribution for anchored sheet pile wall in marine environment:



Resistance to water pressure

The HZ-M system can be submitted to high hydraulic pressures, for instance, when used to build a cofferdam in the middle of a river. The performance of the system under water pressure depends on the chosen combination of HZ-M king pile and AZ infill sheet pile and their respective steel grades. This chapter aims to provide sufficient information to select the optimal HZ/AZ combination for this particular loading case.

Subsequent to former test series with sheet pile sections AZ 13, AZ 18 and AZ 26, a large number of mechanical laboratory testing and finite element simulations were performed for the series AZ-700, AZ-750, AZ-770 and AZ-800 at the Institute of Structural Design of the University of Stuttgart (Germany), to determine the resistance of the HZ-M system to hydraulic pressure. The mechanical tests used several hydraulic jacks applying progressive loads on the upper corners of the AZ piles (Figure 20). Back-calculation of these tests allowed for calibration of a 2D FE model, considering conservative plane stress values, consistent with the 19.7 in test samples.

The results confirm the excellent behaviour of the HZ-M Steel Wall System, which can resist water head differences up to 42.7 ft for the AZ-700 profiles, and up to 32.8 ft for the AZ-800 profiles. Declutching of the interlocks did not occur in any test, which confirms the outstanding reliability of the connectors and the "Larssen" interlocks of the AZ sheet piles.

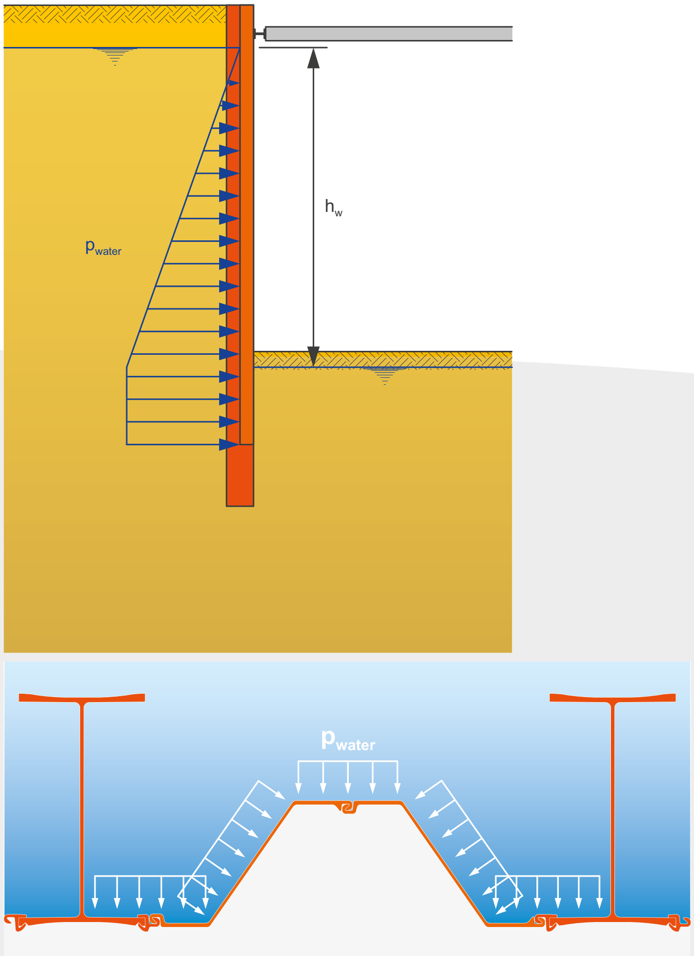


Fig. 19. HZ-M system under water pressure: assumptions.

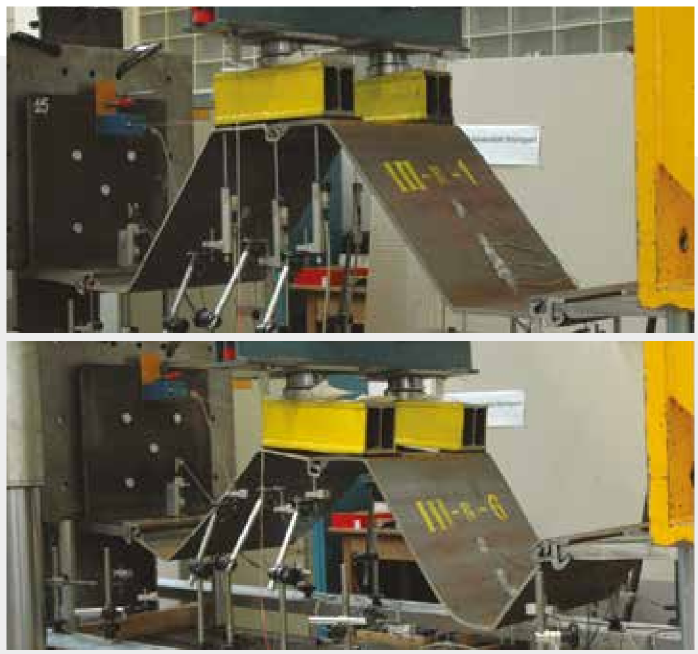


Fig. 20. Mechanical testing of the HZ-M system in the laboratory.

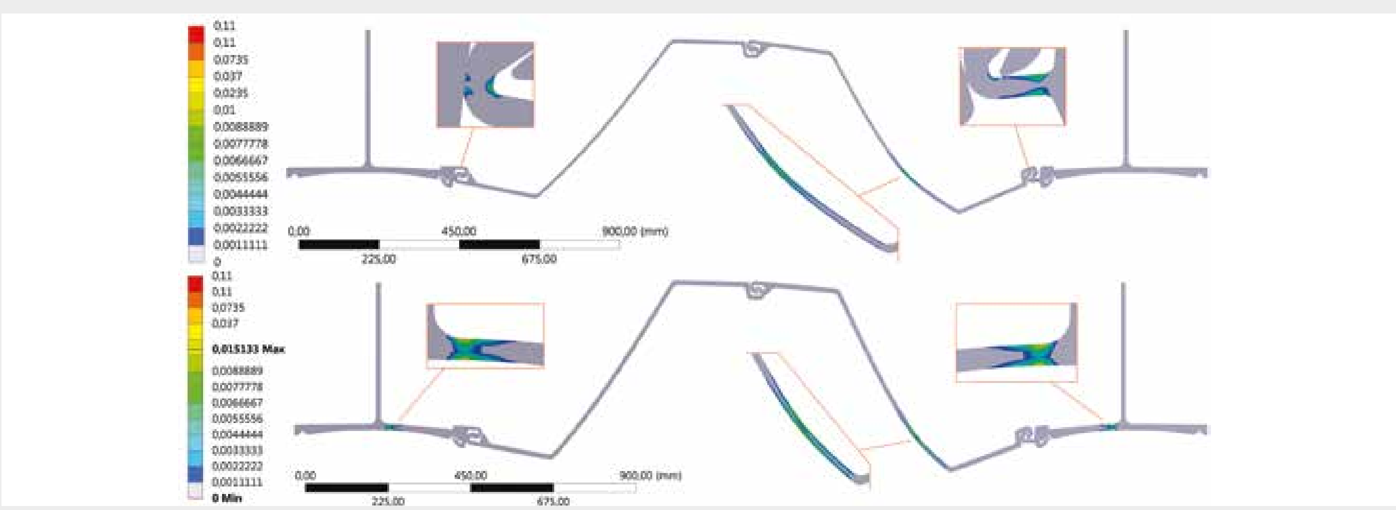


Fig. 21. Numerical simulation of an HZ/AZ combined wall under water pressure.

Characteristic values for maximum water pressures $p_{max,k}$ of the different AZ series (AZ-700, AZ-770, AZ-750 and AZ-800) result from a statistical evaluation of numerical test results from FEA, which have been validated to experimental test results ([10], [11]).

The required safety factors according to Eurocode EN 1993-1-5, Annex C [7], are included in the characteristic values. The characteristic values of the water pressure are listed in the following table, and are valid for the following:

- steel grades
  - > HZ-M S 430 GP & above $f_y \geq 62.4$ ksi
  - > RZD/RZU S 460 GP $f_y \geq 66.7$ ksi
  - > AZ S 240 GP, S 355 GP & S 430 GP
- the structure is submitted to pure water pressure. Eventual additional earth pressures are not considered.

The table is subdivided in three combinations of HZ-M king piles:
- HZ 880M A, S 430 GP & S 460 GP
- HZ 880M B, S 430 GP & S 460 GP
- HZ 880M C, HZ 1080M & HZ 1180M, S 430 GP & S 460 GP

Design values[1] can be obtained by applying the partial safety factor γ_{M0}. Please refer to EN 1993 – Part 5 [1] and the relevant National Annex for γ_{M0} (EN 1993 – Part 5 recommends a value of γ_{M0} = 1.0).

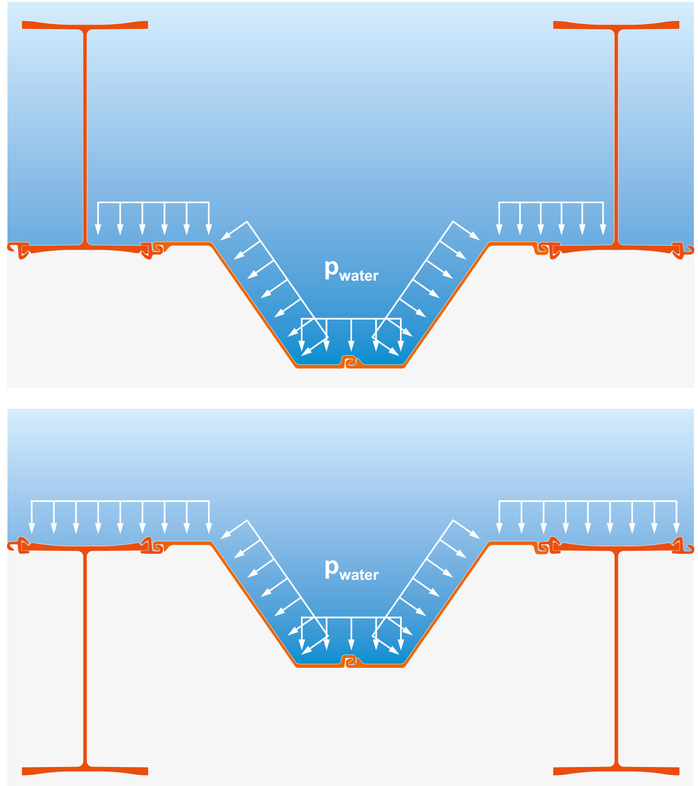


Fig. 22. AZ infill sheet piles under water pressure working in tension.

Impact of driving imperfections :

The impact of driving imperfections of the HZ-M combined wall on the resistance to water pressure was investigated. The range of imperfections considered was ± 5° for rotation and ± 100mm for horizontal displacement (Fig. 23).

The study conducted showed a **reduction limited to 20%** in the water pressure resistance for the range of imperfections and the profiles considered (AZ 18-10/10, AZ 26, AZ 18-700, AZ 20-700, AZ 26-700, AZ 20-800, AZ 22-800, AZ 25-800, AZ 27-800, AZ 30-750, AZ 32-750).

For further information, please contact ArcelorMittal Sheet Piling.

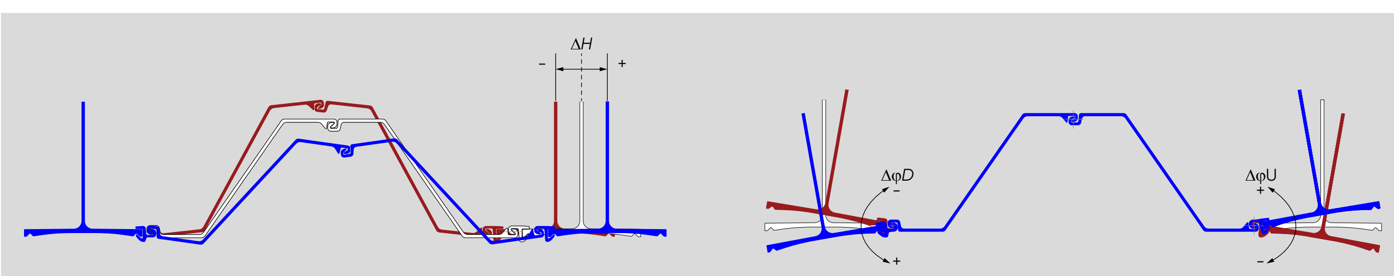


Fig. 23. Considered driving imperfections (± 5° for rotation and ± 100 mm for horizontal displacement).

Notes:
- As a rule of thumb, the resistance of AZ infill sheet piles increases with the yield strength.
- Failure can occur in the AZ infill sheet piles or in the flange of the HZ-M king pile, and consequently the minimum value of both resistances is chosen. Failure of the flange of the lighter HZ 880M series under high pressure governs the resistance in a few cases. **Bold values** in the table correspond to a failure within the HZ-M flange. For the HZ 630M, please contact our technical department.
- It is to be noted that driving tolerances and material thickness losses due to corrosion may have an impact on the water pressure resistance of the infill sheet piles and are not covered by the tabled values.

[1] This procedure is only valid for a "Limit State" design approach as described in European Eurocodes. If the design of the sheet pile structure is based on an "Allowable Stress Design" (ASD) approach, the calculation using characteristic values of the table must be considered with an appropriate global safety factor based on local standards and design rules.

King pile	HZ 880M A						HZ 880M B						HZ 880M C / HZ 1080 M / HZ 1180 M					
HZ-M steel grade	S 430 GP			S 460 GP			S 430 GP			S 460 GP			S 430 GP			S 460 GP		
AZ steel grade	S 240 GP	S 355 GP	S 430 GP	S 240 GP	S 355 GP	S 430 GP	S 240 GP	S 355 GP	S 430 GP	S 240 GP	S 355 GP	S 430 GP	S 240 GP	S 355 GP	S 430 GP	S 240 GP	S 355 GP	S 430 GP
AZ infill sheet	Characteristic values of water pressure $p_{max.k}$ (psi)																	
AZ 18-10/10	10.38	12.99	13.59	10.82	13.55	14.17	11.11	13.91	14.55	11.47	14.34	15.01	11.18	14.00	14.63	11.50	14.39	15.05
AZ 26	12.41	15.55	**16.26**	13.07	16.36	**17.11**	14.47	18.11	18.96	15.18	19.01	19.88	15.58	19.49	20.39	15.98	20.00	20.93
AZ 12-770	5.09	7.53	8.35	5.09	7.53	8.35	5.09	7.53	8.35	5.09	7.53	8.35	5.09	7.53	8.35	5.09	7.53	8.35
AZ 13-770	5.58	8.27	9.14	5.58	8.27	9.14	5.58	8.27	9.14	5.58	8.27	9.14	5.58	8.27	9.14	5.58	8.27	9.14
AZ 14-770	6.09	9.01	9.91	6.09	9.01	9.91	6.09	9.01	9.91	6.09	9.01	9.91	6.09	9.01	9.91	6.09	9.01	9.91
AZ 14-770-10/10	6.58	9.73	10.67	6.58	9.73	10.67	6.58	9.73	10.67	6.58	9.73	10.67	6.58	9.73	10.67	6.58	9.73	10.67
AZ 12-700	6.74	9.98	11.23	6.74	9.98	11.23	6.74	9.98	11.23	6.74	9.98	11.23	6.74	9.98	11.23	6.74	9.98	11.23
AZ 13-700	7.64	11.30	12.79	7.64	11.30	12.79	7.64	11.30	12.79	7.64	11.30	12.79	7.64	11.30	12.79	7.64	11.30	12.79
AZ 13-700-10/10	8.08	11.95	**13.40**	8.08	11.95	13.56	8.08	11.95	**13.40**	8.08	11.95	13.56	8.08	11.95	13.56	8.08	11.95	13.56
AZ 14-700	8.53	12.62	**13.40**	8.53	12.62	**14.26**	8.53	12.62	**13.40**	8.53	12.62	**14.26**	8.53	12.62	14.34	8.53	12.62	14.34
AZ 17-700	5.99	8.86	9.78	5.99	8.86	9.78	5.99	8.86	9.78	5.99	8.86	9.78	5.99	8.86	9.78	5.99	8.86	9.78
AZ 18-700	6.53	9.66	10.69	6.53	9.66	10.69	6.53	9.66	10.69	6.53	9.66	10.69	6.53	9.66	10.69	6.53	9.66	10.69
AZ 19-700	7.06	10.46	11.59	7.06	10.46	11.59	7.06	10.46	11.59	7.06	10.46	11.59	7.06	10.46	11.59	7.06	10.46	11.59
AZ 20-700	7.61	11.25	12.50	7.61	11.25	12.50	7.61	11.25	12.50	7.61	11.25	12.50	7.61	11.25	12.50	7.61	11.25	12.50
AZ 24-700	10.21	12.78	13.37	10.70	13.40	14.01	11.43	14.30	14.95	11.66	14.59	**15.26**	11.53	14.43	15.10	11.75	14.71	15.39
AZ 26-700	10.85	13.59	**14.21**	11.37	14.24	**14.90**	12.56	15.72	16.45	12.95	16.22	16.97	12.94	16.19	16.94	13.17	16.48	17.23
AZ 28-700	11.53	14.43	**15.10**	12.05	15.08	**15.78**	13.31	16.66	17.43	13.91	17.40	18.20	14.32	17.93	18.75	14.63	18.30	19.16
AZ 18-800	5.18	7.28	8.09	5.34	7.48	8.33	5.26	7.41	8.24	5.38	7.59	8.43	5.29	7.51	8.35	5.41	7.69	8.54
AZ 20-800	6.06	8.18	9.08	6.24	8.41	9.34	6.15	8.34	9.25	6.29	8.53	9.47	6.18	8.37	9.30	6.32	8.56	9.50
AZ 22-800	7.03	9.06	10.08	7.24	9.33	10.37	7.14	9.25	10.28	7.31	9.47	10.52	7.18	9.21	10.23	7.34	9.41	10.46
AZ 23-800	6.29	7.89	8.70	6.48	8.09	8.93	6.40	7.93	8.76	6.54	8.12	8.96	6.43	8.04	8.86	6.57	8.24	9.09
AZ 25-800	7.19	8.83	9.76	7.41	9.09	10.05	7.22	9.04	9.98	7.40	9.25	10.21	7.25	9.08	10.04	7.41	9.30	10.25
AZ 27-800	8.09	9.82	**10.62**	8.33	10.09	**11.02**	8.21	10.12	11.18	8.40	10.36	11.44	8.25	10.12	11.17	8.44	10.36	11.43
AZ 28-750	7.64	9.82	10.88	7.86	10.12	11.21	7.76	9.96	11.04	7.93	10.20	11.30	7.80	9.95	11.02	7.98	10.18	11.27
AZ 30-750	8.73	10.96	**11.72**	8.98	11.28	**12.23**	8.86	11.34	12.56	9.06	11.60	12.85	8.91	11.40	12.63	9.11	11.65	12.89
AZ 32-750	9.88	**11.75**	**12.53**	10.17	**12.23**	**13.02**	10.02	12.71	14.07	10.25	13.00	14.39	10.08	12.81	14.18	10.31	13.10	14.50

Cross-sectional classification of HZ®-M (Eurocode 3)

Standard case in pure bending[1)]

The design of steel sheet piles according to the European standards (Eurocode 3) requires the cross-sectional classification of profiles. The standard provides tables for the classification of the most common sections, like tubes, angles, H-beams, but does not deal with special sections like HZ-M with welded connectors on the extremities of the flanges, or sections with specific geometries as curved flanges with an increasing thickness towards its "free" ends.

This is why a realistic classification was prepared to take into account the real geometry and the bending moment distribution for the HZ/AZ system.

A class 2 section may be designed using the plastic section modulus W_{pl} whereas for a class 3 section the designer only uses the elastic section modulus W_{el}. For a class 4 section, local buckling occurs before reaching the elastic bending moment capacity M_{el}.

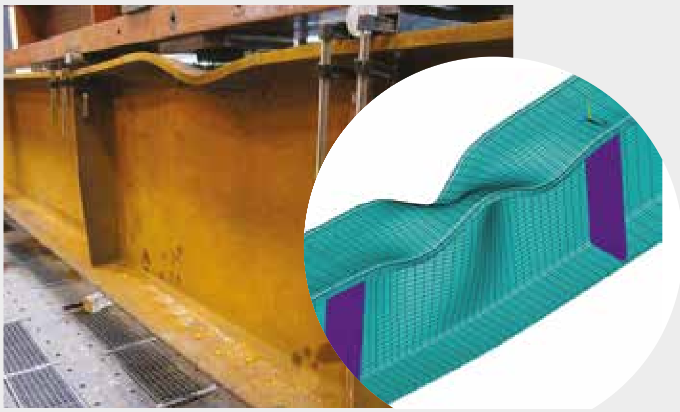
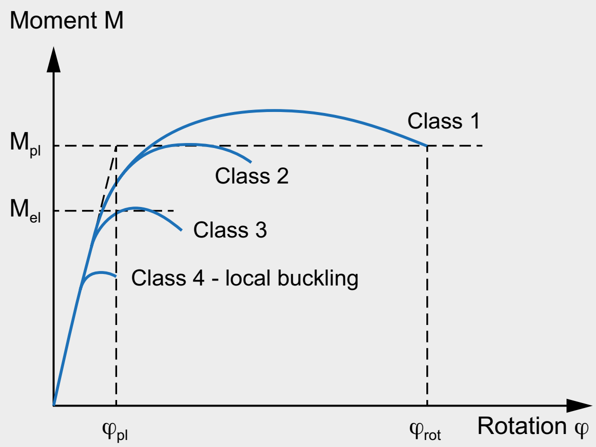
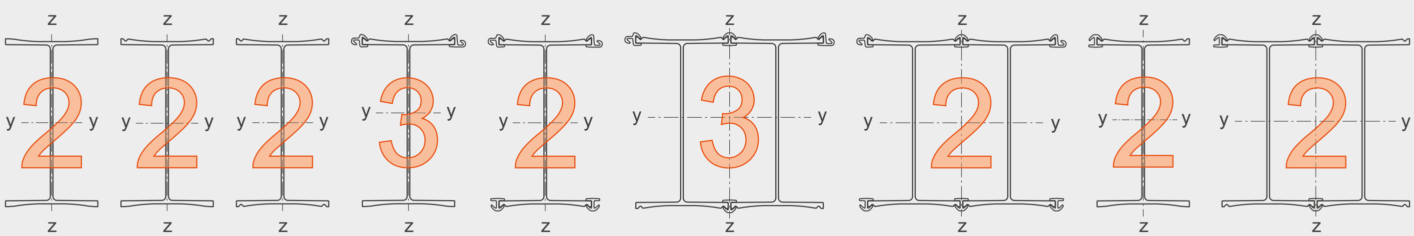


Fig. 24. Comparison between 4 point bending test and FEA simulation.





Cross section classes of HZ-M solutions, valid for the whole HZ-M range with nominal geometries and for steel grades from S 240 GP to S 460 GP.

Fig. 25. Cross section classes for the HZ-M solutions.

In collaboration with the RWTH Aachen University, an experimental campaign on "4 points bending tests" (Figure 24), backed by numerical simulation using a finite element model developed by RWTH, has been performed [8].

The cross section's classes of HZ-M resulting from this campaign are summarized in Figure 25 and are valid for the whole HZ-M range and steel grades from S 240 GP to S 460 GP[2)].

From a safe-sided approach, all sections can be classified as cross-section class 2, for steel grades ranging from S 240 GP to S 460 GP, except for the solutions 12 and 24 (with connectors on the tensile flange or the compression flange) which are classified as class 3.

[1)] In case of a combination of bending moments and significant compression loads, the design of the HZ-M section will generally be governed by the web slenderness (see formulas in EN 1993), except in the case of corrosion of flanges and web.

[2)] For sheet pile applications, all HZ 1180M may be classified in class 1 with verification of the rotation capacity by appropriate calculation methods Otherwise a class 2 should be chosen.

Influence of the loss of steel thickness of the flange

The corrosion phenomenon and its influence on the cross sectional classification was investigated. A parametric study [9] was carried out with the finite element model developed by RWTH considering a loss of steel thickness on one flange (outer face) up to 0.31 in (see Figure 26).

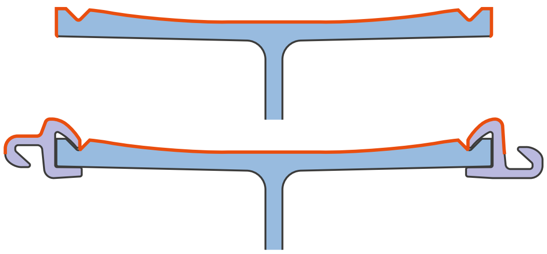


Fig. 26. Corrosion assumption: loss of steel thickness on outer flange.

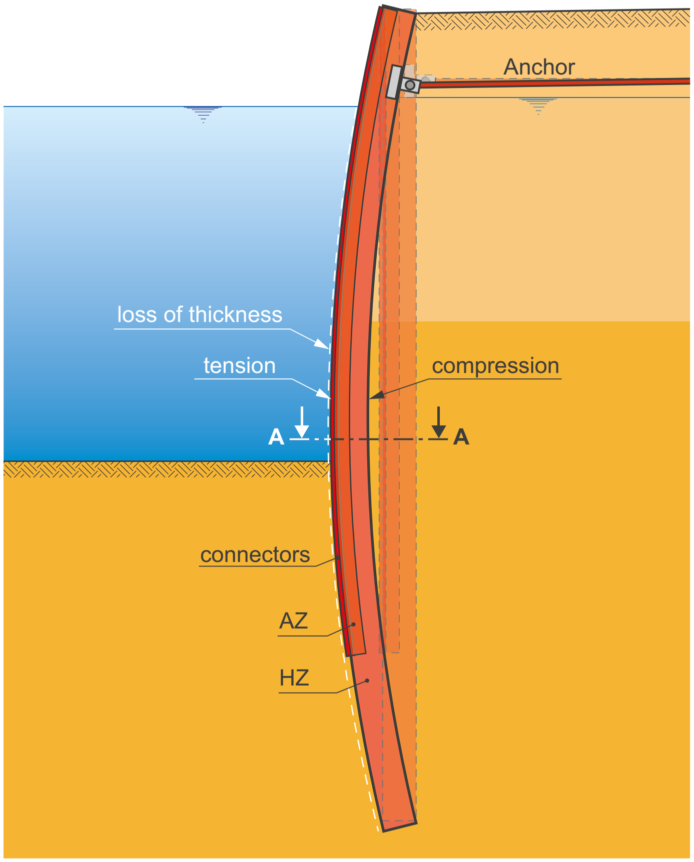
The worst case was considered in this numerical study: the connectors are on the tension flange, and the flange thickness reduction is at the compression flange[1)].

Typically, connectors and corrosion occur on the tension flange, and the cross section class can be chosen from the following table.

Section	Classification for loss of steel thickness 0 - 0.31 in
HZ 880M A	3
HZ 880M B	3
HZ 880M C	3
HZ 1080M A	3
HZ 1080M B	3
HZ 1080M C	2
HZ 1080M D	2
HZ 1180M A	2
HZ 1180M B	2
HZ 1180M C	2
HZ 1180M D	2

Cross section classes with connectors on the tension flange and corrosion on the tension flange, valid for all HZ-M solutions, up to S 460 GP steel grade.

Fig. 27. Cross section classes for corroded HZ-M solutions.



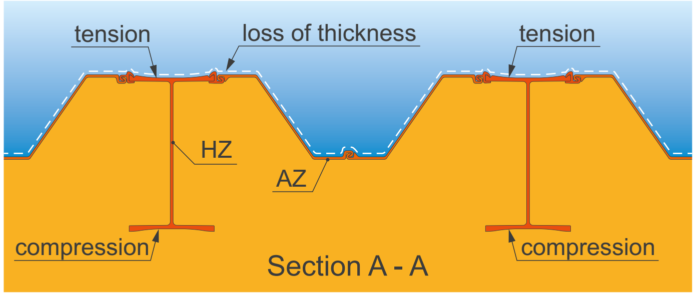


Fig. 28. Common configuration of an HZ/AZ combined wall system (typical cross section).

General conclusions

Combining the results from both research projects, the classification of the cross sections for the HZ-M king pile in pure bending can be summarized as follows:

- **Without corrosion**
  all the HZ-M king piles can be classified as class 2 (except solutions 12 and 24 : class 3)
- **With corrosion**
  for the most common configurations[2)], the effect of the corrosion on the HZ-M classification is very limited.
  All the HZ-M solutions can be calculated in class 2 or 3 for up to 0.31 in of loss of steel according to the table and the sketch above (Figure 27 & 28).

Above conclusions are valid for the whole HZ-M range from HZ 880M A to HZ 1180M D and steel grades S 240 GP up to S 460 GP. Please contact the technical department for the HZ 630M.

Remark: The classification of the HZ-M king piles in pure bending is allowable for king piles subject to combined bending and normal force as long as no interaction between bending and normal force needs to be considered in member design (EN 1993-5, 5.2.3). Classification of king piles subject to higher normal forces may combine classification of the flange according to the tests of HZ-M in pure bending and classification of the web according to EN 1993-1-1.

[1)] "Solution 12" was chosen for all investigations as it is the most critical configuration (safe sided approach).
[2)] Please contact our technical department in case the connectors are on the tension flange and corrosion occurs on the compression flange.

Conventions and Symbols

b	nominal width of the AZ element
b_{sys}	width of one system (HZ/AZ combination)
d	depth of straight portion of web
e	eccentricity
f_y	yield strength of the steel
h_i	height (depth) of the section
i_y	radius of gyration about the y-y axis. $i_y = \sqrt{I_y / A}$
$p_{max,k}$	characteristic value of water pressure
p_{water}	water pressure
r	inner radius of the HZ-M profile, between web and flange
t_f	thickness of the flange / thickness of the HZ-M flange at a distance w/4 from the edge
t_1	thickness for flange bending
t_2	thickness at the edge of the flange
t_3	thickness in the groove
t_{max}	maximum flange thickness
t_w	thickness of the web
v_1, v_2, u_1	distance of the neutral axis to the extreme fibre of the HZ-M flanges
v_3, v_4, u_2	distance of the neutral axis to the extreme fibre of the connector RH/RZ
w	nominal width of HZ-M element
A	cross sectional area
A_v	shear area
A_{HZ}	cross sectional area of the HZ-M king pile
A_{LS}	coating area on the soil side (back), excluding the inside of the interlocks, per element or system width, per unit length
A_{LW}	coating area on the water side (front), excluding the inside of the interlocks, per element or system width, per unit length
G	mass of the element / solution (with length RH/RZ = length HZ) per unit length
$G_{60\%}$	mass of the combination with length of the infill sheet piles AZ = 60% of the length of the HZ-M king piles

$G_{80\%}$	mass of the combination with length of the infill sheet piles AZ = 80% of the length of the HZ-M king piles
$G_{100\%}$	mass of the combination with length of the infill sheet piles AZ = 100% of the length of the HZ-M king piles
I_{AZ}	moment of inertia of one pair of AZ sheet pile
I_{HZ}	moment of inertia of one HZ-M king pile
I_{sys}	moment of inertia of one system (HZ/AZ combination)
$I_{sys/m}$	moment of inertia of the wall per unit length
I_y	moment of inertia about the main neutral axis y-y
I_t	torsional constant
I_w	warping constant
I_z	moment of inertia about the neutral axis z-z (weak axis)
M_{AZ}	bending moment transmitted to the intermediary AZ sheet pile
M_{HZ}	bending moment transmitted to the HZ-M king pile
M_{sys}	maximum bending moment per unit length based on a design
N	vertical load
S_F	global safety factor applicable to steel
S_y	static moment of the HZ-M
W_{AZ}	section modulus of a pair of AZ
$W_{el,y}{}^{*}$	equivalent elastic section modulus of the combination related to the extreme fiber of the flange of the HZ-M
$W_{el,y}{}^{**}$	equivalent elastic section modulus of the combination related to the extreme fiber of the connector RH/RZ
$W_{el,z}$	elastic section modulus of the element related to neutral axis z-z (weak axis)
$W_{HZ,eq.}$	$= W_{el,y}{}^{*}$
$W_{pl,y}$	plastic section modulus of the HZ-M
$W_{RH/RZ,eq.}$	$= W_{el,y}{}^{**}$
σ_{AZ}	steel stresses in the intermediary AZ sheet pile
σ_{HZ}	steel stresses in the HZ-M king pile

Notes:

- The nominal width of a combination b_{sys} has been rounded to a mean value valid for the whole range of a combination. However, the nominal width of the "solutions" has been taken into account for the determination of the section properties. For installation purposes, the nominal system width of the combination "b_{sys}" should be used.
- All the data in the tables in this flyer has been determined with a CAD software. The main section properties have been rounded. Section properties determined in a different way may differ slightly.
- Mass of HZ/AZ combinations: $G_{60\%}$, $G_{80\%}$ & $G_{100\%}$ assume that the length of the connectors RZD/RZU and the RH on the back flange (Sol. 14 and Sol. 26) are the same as the length of the infill sheet piles AZ. The RH connecting two HZ-M king piles (Sol. 24 and Sol. 26) have the same length as the HZ-M king piles.
- Rounding of the mass of single elements of the combined system leads in some cases to slight discrepancies in the mass of the combinations / solutions.

References:

[1] EN 1993 - 5: Eurocode 3. Design of steel structures - Part 5: Piling. CEN.
[2] EN 1997 - 1: Eurocode 7. Geotechnical design - Part 1: General rules. CEN.
[3] EAU 2012. Recommendations of the Committee for Waterfront Structures Harbours and Waterways. Ernst und Sohn.
[4] EN 10248-1: 2023 - Hot-rolled steel sheet piles - Part 1: Technical delivery conditions . CEN.
[5] EN 10248-2: 1995 - Hot-rolled sheet piling of non alloy steels - Part 2: Tolerances on shape and dimensions. CEN.
[6] EN 1990: Eurocode: Basis of structural design. CEN.
[7] EN 1993-1-5: Eurocode 3: Design of steel structures - Part 1-5: Plated structural elements.
[8] Cross sectional classification of ArcelorMittal HZ range. RWTH Aachen. 2012.
[9] Cross sectional classification taking into account corrosion of ArcelorMittal HZ range. RWTH Aachen. 2012.
[10] Ulrike Kuhlmann and Adrian Just, Final Report – Expert Statement – Combined HZ-M/AZ Pile Walls Loaded with Water Pressure. Evaluation of Additional Tests and Statistical Re-evaluation of the Characteristic Resistance Values, Institute of Structural Design, University of Stuttgart, Germany, March 2019.
[11] Ulrike Kuhlmann and Alexander Enders, Final Report – Investigations on combined sheet pile walls (HZ/AZ system) under water pressure loading. Test back-calculation of experimental investigations with five AZ/HZ combinations in reverse setup position (b), Institute of Structural Design, University of Stuttgart, Germany, May 2019.
[12] U. Kuhlmann, J. Grabe, B. Froschmeier, C. Schallück, A. Just: Entwicklung von effizienten Dimensionierungsgrundlagen für die Tragbohlen von kombinierten Stahlspundwänden. Forschung für die Praxis P 813. Forschungsvereinigung Stahlanwendung e.V. (FOSTA), Verlag und Vertriebsgesellschaft mbH, Düsseldorf, 2012.

HZ-M | Static moment & Plastic section modulus

Section	$W_{el,y}$	S_y	$W_{pl,y}$	$W_{el,y}$	S_y	$W_{pl,y}$	$W_{el,y}$	S_y	$W_{pl,y}$
	in^3	in^3	in^3	in^3	in^3	in^3	in^3	in^3	in^3
	Sol. 100			**Sol. 12**			**Sol. 26**		
HZ 630M	437.8	240.4	**480.9**	426.3	237.1	**474.2**	1,070.1	580.0	**1,160.1**
HZ 880M A	551.0	299.9	**600.2**	537.0	296.0	**591.9**	1,368.8	733.5	**1,467.3**
HZ 880M B	602.6	330.4	**660.9**	587.4	326.2	**652.0**	1,467.6	793.0	**1,585.7**
HZ 880M C	635.9	348.4	**696.9**	620.6	344.2	**688.0**	1,532.6	829.0	**1,657.7**
HZ 1080M A	815.0	456.2	**912.3**	797.9	451.0	**901.9**	1,978.1	1,086.8	**2,173.4**
HZ 1080M B	886.1	493.7	**987.7**	866.8	488.2	**976.4**	2,113.6	1,159.8	**2,319.5**
HZ 1080M C	971.5	544.6	**1,089.3**	952.3	538.8	**1,078.0**	2,282.3	1,261.4	**2,523.0**
HZ 1080M D	1,051.4	591.3	**1,182.6**	1,032.5	585.5	**1,171.1**	2,439.7	1,354.7	**2,709.5**
HZ 1180M A	1,109.1	627.0	**1,254.0**	1,090.2	621.2	**1,242.8**	2,552.3	1,426.1	**2,852.3**
HZ 1180M B	1,164.9	657.2	**1,314.2**	1,139.6	649.6	**1,298.9**	2,647.8	1,478.6	**2,957.5**
HZ 1180M C	1,233.0	696.3	**1,392.6**	1,207.7	688.7	**1,377.3**	2,847.7	1,596.4	**3,192.8**
HZ 1180M D	1,301.3	735.6	**1,471.3**	1,262.6	724.0	**1,447.8**	2,951.1	1,659.2	**3,318.5**
	Sol. 102			**Sol. 14**			**Sol. C1**		
HZ 630M	426.3	237.1	**474.2**	571.8	308.8	**617.9**	444.6	255.1	**508.9**
HZ 880M A	537.0	296.0	**591.9**	734.1	392.1	**783.9**	560.5	320.1	**638.3**
HZ 880M B	587.4	326.2	**652.0**	783.2	421.7	**843.4**	612.4	350.0	**699.0**
HZ 880M C	620.6	344.2	**688.0**	815.6	439.7	**879.1**	645.3	368.0	**734.7**
HZ 1080M A	797.9	451.0	**901.9**	1,053.9	576.1	**1,152.4**	830.8	482.4	**963.9**
HZ 1080M B	866.8	488.2	**976.4**	1,121.3	612.7	**1,225.4**	900.7	519.6	**1,038.3**
HZ 1080M C	952.3	538.8	**1,078.0**	1,205.2	663.6	**1,327.0**	986.5	570.6	**1,140.2**
HZ 1080M D	1,032.5	585.5	**1,171.1**	1,283.6	710.0	**1,420.3**	1,066.4	617.3	**1,233.6**
HZ 1180M A	1,090.2	621.2	**1,242.8**	1,339.2	745.7	**1,491.7**	1,124.1	653.0	**1,305.3**
HZ 1180M B	1,139.6	649.6	**1,298.9**	1,386.8	772.3	**1,544.2**	1,178.4	681.3	**1,361.8**
HZ 1180M C	1,207.7	688.7	**1,377.3**	1,488.1	834.5	**1,668.7**	1,250.4	728.0	**1,455.1**
HZ 1180M D	1,262.6	724.0	**1,447.8**	1,539.3	865.9	**1,731.9**	1,316.0	763.7	**1,526.8**
	Sol. 104			**Sol. 24**			**Sol. C23**		
HZ 630M	424.4	233.7	**467.7**	937.9	540.7	**1,077.4**	931.2	523.0	**1,045.3**
HZ 880M A	534.6	292.0	**584.3**	1,190.6	681.3	**1,358.4**	1,180.8	657.8	**1,314.8**
HZ 880M B	584.9	321.6	**643.5**	1,291.9	739.9	**1,478.0**	1,281.2	717.3	**1,433.5**
HZ 880M C	618.2	339.6	**679.5**	1,357.2	777.1	**1,550.0**	1,346.8	753.3	**1,505.5**
HZ 1080M A	794.5	446.1	**891.9**	1,754.7	1,019.4	**2,036.4**	1,737.7	988.3	**1,975.7**
HZ 1080M B	863.2	482.4	**965.1**	1,889.9	1,092.6	**2,182.5**	1,873.4	1,061.2	**2,121.8**
HZ 1080M C	948.6	533.3	**1,066.7**	2,060.8	1,194.5	**2,386.6**	2,044.0	1,163.1	**2,325.3**
HZ 1080M D	1,028.9	580.0	**1,160.1**	2,220.1	1,287.9	**2,573.4**	2,203.3	1,256.2	**2,512.1**
HZ 1180M A	1,086.5	615.7	**1,231.5**	2,334.8	1,359.6	**2,716.5**	2,317.7	1,327.6	**2,654.8**
HZ 1180M B	1,135.0	642.0	**1,283.9**	2.430.3	1,412.1	**2,821.7**	2,413.8	1,380.4	**2,760.1**
HZ 1180M C	1,202.8	681.0	**1,362.4**	2,599.6	1,513.4	**3,023.7**	2,584.1	1,482.6	**2,964.5**
HZ 1180M D	1,255.3	712.5	**1,425.2**	2,704.0	1,576.2	**3,149.8**	2,688.7	1,545.7	**3,090.3**

The plastic section modulus $W_{pl,y}$ applies only for steel stress verification of "class 1" and "class 2" sections according to EN 1993.

Table of combinations sorted by ascending Elastic section modulus

$W_{el,y}$*	$G_{100\%}$	Section	Combination
in³/ft	lb/ft²		
77	43	HZ 630M	12/AZ 13-770
78	44	HZ 630M	12/AZ 14-770-10/10
81	46	HZ 630M	12/AZ 13-700
81	46	HZ 630M	12/AZ 13-700-10/10
85	44	HZ 630M	12/AZ 20-800
85	45	HZ 630M	12/AZ 20-800-10/10
88	46	HZ 630M	12/AZ 18-700
89	48	HZ 630M	12/AZ 20-700
91	47	HZ 630M	12/AZ 25-800
91	41	HZ 880M A	12/AZ 13-770
91	43	HZ 880M A	12/AZ 14-770-10/10
92	50	HZ 630M	12/AZ 18-10/10
96	43	HZ 880M A	12/AZ 20-800
96	46	HZ 630M	14/AZ 13-770
96	43	HZ 880M A	12/AZ 20-800-10/10
96	44	HZ 880M A	12/AZ 13-700
96	45	HZ 880M A	12/AZ 13-700-10/10
97	47	HZ 630M	14/AZ 14-770-10/10
97	52	HZ 630M	12/AZ 26-700
99	49	HZ 630M	12/AZ 28-750
99	44	HZ 880M B	12/AZ 13-770
99	45	HZ 880M B	12/AZ 14-770-10/10
100	45	HZ 880M A	12/AZ 25-800
100	55	HZ 630M	12/AZ 26
101	51	HZ 630M	12/AZ 30-750
101	49	HZ 630M	14/AZ 13-700
101	44	HZ 880M A	12/AZ 18-700
102	50	HZ 630M	14/AZ 13-700-10/10
102	46	HZ 880M A	12/AZ 20-700
103	52	HZ 630M	12/AZ 32-750
103	45	HZ 880M B	12/AZ 20-800
103	45	HZ 880M C	12/AZ 13-770
104	46	HZ 880M B	12/AZ 20-800-10/10
104	46	HZ 880M C	12/AZ 14-770-10/10
104	47	HZ 630M	14/AZ 20-800
104	47	HZ 880M B	12/AZ 13-700
105	47	HZ 880M B	12/AZ 13-700-10/10
105	48	HZ 630M	14/AZ 20-800-10/10
108	48	HZ 880M A	12/AZ 18-10/10
108	47	HZ 880M A	12/AZ 28-750
108	48	HZ 880M B	12/AZ 25-800
108	46	HZ 880M C	12/AZ 20-800
108	50	HZ 880M A	12/AZ 26-700
108	47	HZ 880M C	12/AZ 20-800-10/10
109	49	HZ 630M	14/AZ 18-700
109	49	HZ 880M A	12/AZ 30-750
110	48	HZ 880M C	12/AZ 13-700
110	47	HZ 880M B	12/AZ 18-700
110	48	HZ 880M C	12/AZ 13-700-10/10
111	51	HZ 630M	14/AZ 20-700
111	49	HZ 880M B	12/AZ 20-700
111	50	HZ 880M A	12/AZ 32-750
111	50	HZ 630M	14/AZ 25-800
112	49	HZ 880M C	12/AZ 25-800
113	53	HZ 880M A	12/AZ 26
115	48	HZ 880M C	12/AZ 18-700
115	54	HZ 630M	14/AZ 18-10/10
116	50	HZ 880M B	12/AZ 28-750
116	50	HZ 880M C	12/AZ 20-700
116	44	HZ 880M A	14/AZ 13-770
116	51	HZ 880M B	12/AZ 18-10/10
116	53	HZ 880M B	12/AZ 26-700
117	46	HZ 880M A	14/AZ 14-770-10/10
117	51	HZ 880M B	12/AZ 30-750
119	53	HZ 880M B	12/AZ 32-750
119	55	HZ 630M	14/AZ 26-700
120	52	HZ 630M	14/AZ 28-750
120	51	HZ 880M C	12/AZ 28-750
121	45	HZ 880M A	14/AZ 20-800
121	46	HZ 880M A	14/AZ 20-800-10/10
121	54	HZ 880M C	12/AZ 26-700
122	52	HZ 880M C	12/AZ 18-10/10
122	52	HZ 880M C	12/AZ 30-750
122	56	HZ 880M B	12/AZ 26
122	54	HZ 630M	14/AZ 30-750
123	47	HZ 880M A	14/AZ 13-700
123	47	HZ 880M B	14/AZ 13-770
123	48	HZ 880M A	14/AZ 13-700-10/10
124	54	HZ 880M C	12/AZ 32-750
124	48	HZ 880M B	14/AZ 14-770-10/10
124	58	HZ 630M	14/AZ 26
124	58	HZ 630M	24/AZ 13-770
125	59	HZ 630M	24/AZ 14-770-10/10
125	55	HZ 630M	14/AZ 32-750
126	48	HZ 880M A	14/AZ 25-800
128	48	HZ 880M B	14/AZ 20-800
128	48	HZ 880M C	14/AZ 13-770
128	57	HZ 880M C	12/AZ 26
128	48	HZ 880M B	14/AZ 20-800-10/10
128	49	HZ 880M C	14/AZ 14-770-10/10
129	48	HZ 880M A	14/AZ 18-700
130	58	HZ 630M	24/AZ 20-800
130	49	HZ 880M A	14/AZ 20-700
130	61	HZ 630M	24/AZ 13-700
130	59	HZ 630M	24/AZ 20-800-10/10
130	61	HZ 630M	24/AZ 13-700-10/10
130	47	HZ 1080M A	12/AZ 13-770
131	50	HZ 880M B	14/AZ 13-700
131	50	HZ 880M B	14/AZ 13-700-10/10
131	48	HZ 1080M A	12/AZ 14-770-10/10
132	49	HZ 880M C	14/AZ 20-800
133	48	HZ 1080M A	12/AZ 20-800
133	50	HZ 880M B	14/AZ 25-800
133	50	HZ 880M C	14/AZ 20-800-10/10
133	49	HZ 1080M A	12/AZ 20-800-10/10
135	50	HZ 880M A	14/AZ 28-750
135	61	HZ 630M	24/AZ 25-800
136	51	HZ 880M C	14/AZ 13-700
136	51	HZ 880M C	14/AZ 13-700-10/10
136	51	HZ 1080M A	12/AZ 25-800
136	61	HZ 630M	24/AZ 18-700
136	53	HZ 880M A	14/AZ 26-700
136	50	HZ 880M B	14/AZ 18-700
137	52	HZ 880M A	14/AZ 30-750
137	52	HZ 880M A	14/AZ 18-10/10
137	63	HZ 630M	24/AZ 20-700
137	52	HZ 880M C	14/AZ 25-800
137	52	HZ 880M B	14/AZ 20-700
138	53	HZ 880M A	14/AZ 32-750
139	50	HZ 1080M A	12/AZ 13-700
139	51	HZ 1080M A	12/AZ 13-700-10/10
141	49	HZ 1080M B	12/AZ 13-770
141	60	HZ 630M	26/AZ 13-770
141	50	HZ 1080M B	12/AZ 14-770-10/10
141	51	HZ 880M C	14/AZ 18-700
142	62	HZ 630M	26/AZ 14-770-10/10
142	53	HZ 880M B	14/AZ 28-750
142	53	HZ 880M C	14/AZ 20-700
143	50	HZ 1080M B	12/AZ 20-800
143	66	HZ 630M	24/AZ 18-10/10
143	51	HZ 1080M B	12/AZ 20-800-10/10
143	51	HZ 1080M A	12/AZ 18-700
143	56	HZ 880M A	14/AZ 26
143	63	HZ 630M	24/AZ 28-750
144	66	HZ 630M	24/AZ 26-700
144	54	HZ 880M B	14/AZ 30-750
144	56	HZ 880M B	14/AZ 26-700
144	52	HZ 1080M A	12/AZ 20-700
145	53	HZ 1080M A	12/AZ 28-750
145	54	HZ 880M B	14/AZ 18-10/10
145	64	HZ 630M	24/AZ 30-750
145	56	HZ 880M B	14/AZ 32-750
146	53	HZ 1080M B	12/AZ 25-800
146	55	HZ 1080M A	12/AZ 30-750
146	61	HZ 630M	26/AZ 20-800
147	54	HZ 880M C	14/AZ 28-750
147	66	HZ 630M	24/AZ 32-750
147	56	HZ 1080M A	12/AZ 32-750
147	62	HZ 630M	26/AZ 20-800-10/10
148	64	HZ 630M	26/AZ 13-700
148	64	HZ 630M	26/AZ 13-700-10/10
148	56	HZ 1080M A	12/AZ 26-700
148	55	HZ 880M C	14/AZ 30-750
149	57	HZ 880M C	14/AZ 26-700
149	55	HZ 880M A	24/AZ 13-770
149	69	HZ 630M	24/AZ 26

$W_{el,y}$*	$G_{100\%}$	Section	Combination
in³/ft	lb/ft²		
149	56	**HZ 880M A**	24/AZ 14-770-10/10
150	52	**HZ 1080M B**	12/AZ 13-700
150	57	**HZ 880M C**	14/AZ 32-750
150	53	**HZ 1080M B**	12/AZ 13-700-10/10
150	56	**HZ 880M C**	14/AZ 18-10/10
151	59	**HZ 880M B**	14/AZ 26
152	55	**HZ 880M A**	24/AZ 20-800
152	63	**HZ 630M**	26/AZ 25-800
152	56	**HZ 880M A**	24/AZ 20-800-10/10
153	55	**HZ 1080M A**	12/AZ 18-10/10
153	52	**HZ 1080M C**	12/AZ 13-770
154	53	**HZ 1080M C**	12/AZ 14-770-10/10
154	52	**HZ 1080M B**	12/AZ 18-700
154	64	**HZ 630M**	26/AZ 18-700
155	53	**HZ 1080M C**	12/AZ 20-800
155	54	**HZ 1080M B**	12/AZ 20-700
155	54	**HZ 1080M C**	12/AZ 20-800-10/10
155	55	**HZ 1080M B**	12/AZ 28-750
155	65	**HZ 630M**	26/AZ 20-700
156	57	**HZ 880M A**	24/AZ 25-800
156	56	**HZ 1080M B**	12/AZ 30-750
156	57	**HZ 880M A**	24/AZ 13-700
157	58	**HZ 880M A**	24/AZ 13-700-10/10
157	60	**HZ 880M C**	14/AZ 26
157	59	**HZ 1080M A**	12/AZ 26
158	58	**HZ 1080M B**	12/AZ 32-750
158	56	**HZ 1080M C**	12/AZ 25-800
159	58	**HZ 1080M B**	12/AZ 26-700
161	59	**HZ 880M B**	24/AZ 13-770
161	58	**HZ 880M A**	24/AZ 18-700
161	60	**HZ 880M B**	24/AZ 14-770-10/10
161	66	**HZ 630M**	26/AZ 28-750
162	50	**HZ 1080M A**	14/AZ 13-770
162	59	**HZ 880M A**	24/AZ 20-700
162	68	**HZ 630M**	26/AZ 18-10/10
162	51	**HZ 1080M A**	14/AZ 14-770-10/10
162	69	**HZ 630M**	26/AZ 26-700
163	67	**HZ 630M**	26/AZ 30-750
163	51	**HZ 1080M A**	14/AZ 20-800
163	59	**HZ 880M B**	24/AZ 20-800
164	55	**HZ 1080M C**	12/AZ 13-700
164	56	**HZ 1080M C**	12/AZ 13-700-10/10
164	52	**HZ 1080M A**	14/AZ 20-800-10/10
164	60	**HZ 880M B**	24/AZ 20-800-10/10
164	59	**HZ 880M A**	24/AZ 28-750
165	57	**HZ 1080M B**	12/AZ 18-10/10
165	55	**HZ 1080M D**	12/AZ 13-770
165	68	**HZ 630M**	26/AZ 32-750
165	61	**HZ 880M A**	24/AZ 30-750
165	56	**HZ 1080M D**	12/AZ 14-770-10/10
166	56	**HZ 1080M D**	12/AZ 20-800
166	62	**HZ 880M A**	24/AZ 26-700

$W_{el,y}$*	$G_{100\%}$	Section	Combination
in³/ft	lb/ft²		
167	56	**HZ 1080M D**	12/AZ 20-800-10/10
167	62	**HZ 880M A**	24/AZ 32-750
167	54	**HZ 1080M A**	14/AZ 25-800
167	61	**HZ 880M B**	24/AZ 25-800
168	56	**HZ 1080M C**	12/AZ 18-700
168	58	**HZ 1080M C**	12/AZ 28-750
168	57	**HZ 1080M C**	12/AZ 20-700
168	60	**HZ 880M C**	24/AZ 13-770
169	72	**HZ 630M**	26/AZ 26
169	61	**HZ 880M C**	24/AZ 14-770-10/10
169	62	**HZ 880M B**	24/AZ 13-700
169	62	**HZ 880M B**	24/AZ 13-700-10/10
169	61	**HZ 1080M B**	12/AZ 26
169	62	**HZ 880M A**	24/AZ 18-10/10
169	60	**HZ 1080M C**	12/AZ 30-750
170	58	**HZ 1080M D**	12/AZ 25-800
171	57	**HZ 880M A**	26/AZ 13-770
171	61	**HZ 1080M C**	12/AZ 32-750
171	61	**HZ 880M C**	24/AZ 20-800
171	58	**HZ 880M A**	26/AZ 14-770-10/10
171	62	**HZ 880M C**	24/AZ 20-800-10/10
171	52	**HZ 1080M B**	14/AZ 13-770
172	53	**HZ 1080M B**	14/AZ 14-770-10/10
172	53	**HZ 1080M A**	14/AZ 13-700
172	54	**HZ 1080M A**	14/AZ 13-700-10/10
173	62	**HZ 1080M C**	12/AZ 26-700
173	53	**HZ 1080M B**	14/AZ 20-800
173	58	**HZ 880M A**	26/AZ 20-800
173	53	**HZ 1080M B**	14/AZ 20-800-10/10
173	62	**HZ 880M B**	24/AZ 18-700
173	57	**HZ 1180M A**	12/AZ 13-770
174	58	**HZ 880M A**	26/AZ 20-800-10/10
174	58	**HZ 1180M A**	12/AZ 14-770-10/10
174	65	**HZ 880M A**	24/AZ 26
174	63	**HZ 880M B**	24/AZ 20-700
174	58	**HZ 1180M A**	12/AZ 20-800
175	58	**HZ 1180M A**	12/AZ 20-800-10/10
175	63	**HZ 880M C**	24/AZ 25-800
176	64	**HZ 880M B**	24/AZ 28-750
176	58	**HZ 1080M D**	12/AZ 13-700
176	59	**HZ 1080M D**	12/AZ 13-700-10/10
177	54	**HZ 1080M A**	14/AZ 18-700
177	55	**HZ 1080M B**	14/AZ 25-800
177	64	**HZ 880M C**	24/AZ 13-700
177	65	**HZ 880M B**	24/AZ 30-750
177	60	**HZ 880M A**	26/AZ 25-800
177	64	**HZ 880M C**	24/AZ 13-700-10/10
178	55	**HZ 1080M A**	14/AZ 20-700
178	56	**HZ 1080M A**	14/AZ 28-750
178	60	**HZ 1180M A**	12/AZ 25-800
179	66	**HZ 880M B**	24/AZ 32-750
179	58	**HZ 1080M A**	14/AZ 30-750

$W_{el,y}$*	$G_{100\%}$	Section	Combination
in³/ft	lb/ft²		
179	67	**HZ 880M B**	24/AZ 26-700
179	61	**HZ 1080M C**	12/AZ 18-10/10
179	60	**HZ 880M A**	26/AZ 13-700
180	61	**HZ 880M A**	26/AZ 13-700-10/10
180	61	**HZ 1080M D**	12/AZ 28-750
180	59	**HZ 1080M D**	12/AZ 18-700
180	59	**HZ 1080M A**	14/AZ 32-750
181	60	**HZ 1080M D**	12/AZ 20-700
181	62	**HZ 1080M D**	12/AZ 30-750
181	58	**HZ 1180M B**	12/AZ 13-770
182	64	**HZ 880M C**	24/AZ 18-700
182	59	**HZ 1180M B**	12/AZ 14-770-10/10
182	59	**HZ 1180M B**	12/AZ 20-800
182	61	**HZ 880M B**	26/AZ 13-770
182	59	**HZ 1080M A**	14/AZ 26-700
182	60	**HZ 1180M B**	12/AZ 20-800-10/10
182	64	**HZ 1080M D**	12/AZ 32-750
182	65	**HZ 880M C**	24/AZ 20-700
183	62	**HZ 880M B**	26/AZ 14-770-10/10
183	66	**HZ 880M B**	24/AZ 18-10/10
183	55	**HZ 1080M B**	14/AZ 13-700
183	56	**HZ 1080M B**	14/AZ 13-700-10/10
184	55	**HZ 1080M C**	14/AZ 13-770
184	65	**HZ 1080M C**	12/AZ 26
184	65	**HZ 880M C**	24/AZ 28-750
184	61	**HZ 880M A**	26/AZ 18-700
184	56	**HZ 1080M C**	14/AZ 14-770-10/10
185	62	**HZ 880M B**	26/AZ 20-800
185	56	**HZ 1080M C**	14/AZ 20-800
185	62	**HZ 880M A**	26/AZ 20-700
185	60	**HZ 1180M A**	12/AZ 13-700
185	62	**HZ 880M B**	26/AZ 20-800-10/10
185	57	**HZ 1080M C**	14/AZ 20-800-10/10
185	67	**HZ 880M C**	24/AZ 30-750
185	61	**HZ 1180M A**	12/AZ 13-700-10/10
185	64	**HZ 1080M D**	12/AZ 26-700
185	62	**HZ 1180M B**	12/AZ 25-800
187	68	**HZ 880M C**	24/AZ 32-750
187	62	**HZ 880M A**	26/AZ 28-750
187	68	**HZ 880M C**	24/AZ 26-700
187	56	**HZ 1080M B**	14/AZ 18-700
187	70	**HZ 880M B**	24/AZ 26
188	58	**HZ 1080M B**	14/AZ 28-750
188	57	**HZ 1080M B**	14/AZ 20-700
188	63	**HZ 880M A**	26/AZ 30-750
188	58	**HZ 1080M C**	14/AZ 25-800
188	63	**HZ 1180M A**	12/AZ 28-750
189	64	**HZ 880M B**	26/AZ 25-800
189	59	**HZ 1080M B**	14/AZ 30-750
189	58	**HZ 1080M A**	14/AZ 18-10/10
189	61	**HZ 1180M A**	12/AZ 18-700
190	65	**HZ 880M A**	26/AZ 32-750

$W_{el,y}$*	$G_{100\%}$	Section	Combination
in^3/ft	lb/ft^2		
190	64	HZ 1180M A	12/AZ 30-750
190	63	HZ 880M C	26/AZ 13-770
190	62	HZ 1180M A	12/AZ 20-700
190	65	HZ 880M A	26/AZ 26-700
190	61	HZ 1080M B	14/AZ 32-750
190	64	HZ 880M C	26/AZ 14-770-10/10
191	66	HZ 1180M A	12/AZ 32-750
191	68	HZ 880M C	24/AZ 18-10/10
192	64	HZ 880M B	26/AZ 13-700
192	61	HZ 1180M C	12/AZ 13-770
192	65	HZ 880M B	26/AZ 13-700-10/10
192	61	HZ 1180M C	12/AZ 20-800
192	63	HZ 880M C	26/AZ 20-800
192	62	HZ 1180M C	12/AZ 14-770-10/10
192	62	HZ 1180M C	12/AZ 20-800-10/10
193	64	HZ 880M C	26/AZ 20-800-10/10
193	64	HZ 1080M D	12/AZ 18-10/10
193	61	HZ 1080M B	14/AZ 26-700
194	62	HZ 1180M B	12/AZ 13-700
194	63	HZ 1180M B	12/AZ 13-700-10/10
194	65	HZ 880M A	26/AZ 18-10/10
194	63	HZ 1080M A	14/AZ 26
194	67	HZ 1180M A	12/AZ 26-700
195	58	HZ 1080M D	14/AZ 13-770
195	64	HZ 1180M C	12/AZ 25-800
196	59	HZ 1080M D	14/AZ 14-770-10/10
196	58	HZ 1080M D	14/AZ 20-800
196	58	HZ 1080M C	14/AZ 13-700
196	59	HZ 1080M C	14/AZ 13-700-10/10
196	66	HZ 880M C	26/AZ 25-800
196	72	HZ 880M C	24/AZ 26
196	59	HZ 1080M D	14/AZ 20-800-10/10
196	65	HZ 880M B	26/AZ 18-700
197	64	HZ 1180M B	12/AZ 28-750
197	66	HZ 880M B	26/AZ 20-700
197	68	HZ 1080M D	12/AZ 26
198	62	HZ 1180M B	12/AZ 18-700
198	66	HZ 1180M B	12/AZ 30-750
198	64	HZ 1180M B	12/AZ 20-700
198	66	HZ 880M B	26/AZ 28-750
199	68	HZ 880M A	26/AZ 26
199	67	HZ 1180M B	12/AZ 32-750
199	61	HZ 1080M D	14/AZ 25-800
200	66	HZ 880M C	26/AZ 13-700
200	67	HZ 880M B	26/AZ 30-750
200	61	HZ 1080M C	14/AZ 28-750
200	67	HZ 880M C	26/AZ 13-700-10/10
200	59	HZ 1080M C	14/AZ 18-700
200	60	HZ 1080M B	14/AZ 18-10/10
201	60	HZ 1080M C	14/AZ 20-700
201	63	HZ 1080M C	14/AZ 30-750
201	69	HZ 880M B	26/AZ 32-750

$W_{el,y}$*	$G_{100\%}$	Section	Combination
in^3/ft	lb/ft^2		
201	63	HZ 1180M D	12/AZ 13-770
201	63	HZ 1180M D	12/AZ 20-800
202	64	HZ 1180M D	12/AZ 14-770-10/10
202	64	HZ 1180M D	12/AZ 20-800-10/10
202	69	HZ 880M B	26/AZ 26-700
202	66	HZ 1180M A	12/AZ 18-10/10
203	64	HZ 1080M C	14/AZ 32-750
203	68	HZ 1180M B	12/AZ 26-700
203	60	HZ 1180M A	14/AZ 13-770
204	60	HZ 1180M A	14/AZ 20-800
204	61	HZ 1180M A	14/AZ 14-770-10/10
204	61	HZ 1180M A	14/AZ 20-800-10/10
204	67	HZ 880M C	26/AZ 18-700
205	65	HZ 1180M C	12/AZ 13-700
205	65	HZ 1180M C	12/AZ 13-700-10/10
205	66	HZ 1180M D	12/AZ 25-800
205	68	HZ 880M C	26/AZ 20-700
205	65	HZ 1080M B	14/AZ 26
206	65	HZ 1080M C	14/AZ 26-700
206	68	HZ 880M C	26/AZ 28-750
207	69	HZ 880M B	26/AZ 18-10/10
207	67	HZ 1180M C	12/AZ 28-750
207	71	HZ 1180M A	12/AZ 26
207	63	HZ 1180M A	14/AZ 25-800
208	69	HZ 880M C	26/AZ 30-750
208	61	HZ 1080M D	14/AZ 13-700
208	68	HZ 1180M C	12/AZ 30-750
208	62	HZ 1080M D	14/AZ 13-700-10/10
209	65	HZ 1180M C	12/AZ 18-700
209	71	HZ 880M C	26/AZ 32-750
209	67	HZ 1180M C	12/AZ 20-700
209	70	HZ 1180M C	12/AZ 32-750
210	61	HZ 1180M B	14/AZ 13-770
210	62	HZ 1180M B	14/AZ 20-800
210	71	HZ 880M C	26/AZ 26-700
211	62	HZ 1180M B	14/AZ 14-770-10/10
211	62	HZ 1180M B	14/AZ 20-800-10/10
211	64	HZ 1080M D	14/AZ 28-750
212	68	HZ 1180M B	12/AZ 18-10/10
212	73	HZ 880M B	26/AZ 26
213	62	HZ 1080M D	14/AZ 18-700
213	65	HZ 1080M D	14/AZ 30-750
213	63	HZ 1080M D	14/AZ 20-700
214	71	HZ 1180M C	12/AZ 26-700
214	64	HZ 1180M B	14/AZ 25-800
214	67	HZ 1080M D	14/AZ 32-750
214	64	HZ 1080M C	14/AZ 18-10/10
215	67	HZ 1180M D	12/AZ 13-700
215	67	HZ 1180M D	12/AZ 13-700-10/10
215	71	HZ 880M C	26/AZ 18-10/10
216	64	HZ 1080M A	24/AZ 20-800
216	64	HZ 1080M A	24/AZ 13-770

$W_{el,y}$*	$G_{100\%}$	Section	Combination
in^3/ft	lb/ft^2		
216	65	HZ 1080M A	24/AZ 20-800-10/10
216	65	HZ 1080M A	24/AZ 14-770-10/10
216	72	HZ 1180M B	12/AZ 26
217	63	HZ 1180M A	14/AZ 13-700
217	69	HZ 1180M D	12/AZ 28-750
217	64	HZ 1180M A	14/AZ 13-700-10/10
218	67	HZ 1080M D	14/AZ 26-700
218	71	HZ 1180M D	12/AZ 30-750
219	67	HZ 1080M A	24/AZ 25-800
219	67	HZ 1180M D	12/AZ 18-700
219	68	HZ 1080M C	14/AZ 26
219	72	HZ 1180M D	12/AZ 32-750
220	66	HZ 1180M A	14/AZ 28-750
220	69	HZ 1180M D	12/AZ 20-700
220	75	HZ 880M C	26/AZ 26
221	67	HZ 1180M A	14/AZ 30-750
221	64	HZ 1180M A	14/AZ 18-700
222	66	HZ 1180M A	14/AZ 20-700
222	69	HZ 1180M A	14/AZ 32-750
224	71	HZ 1180M C	12/AZ 18-10/10
224	73	HZ 1180M D	12/AZ 26-700
224	65	HZ 1180M B	14/AZ 13-700
225	65	HZ 1180M C	14/AZ 20-800
225	65	HZ 1180M B	14/AZ 13-700-10/10
225	64	HZ 1180M C	14/AZ 13-770
225	66	HZ 1180M C	14/AZ 20-800-10/10
225	66	HZ 1180M C	14/AZ 14-770-10/10
227	67	HZ 1180M B	14/AZ 28-750
227	70	HZ 1180M A	14/AZ 26-700
228	67	HZ 1080M D	14/AZ 18-10/10
228	67	HZ 1080M A	24/AZ 13-700
228	68	HZ 1080M A	24/AZ 13-700-10/10
228	69	HZ 1180M B	14/AZ 30-750
228	75	HZ 1180M C	12/AZ 26
228	68	HZ 1180M C	14/AZ 25-800
229	65	HZ 1180M B	14/AZ 18-700
229	69	HZ 1080M A	24/AZ 28-750
229	70	HZ 1180M B	14/AZ 32-750
229	67	HZ 1180M B	14/AZ 20-700
230	70	HZ 1080M A	24/AZ 30-750
231	68	HZ 1080M A	24/AZ 18-700
231	72	HZ 1080M A	24/AZ 32-750
232	67	HZ 1080M B	24/AZ 20-800
232	69	HZ 1080M A	24/AZ 20-700
232	67	HZ 1180M D	14/AZ 20-800
232	68	HZ 1080M B	24/AZ 20-800-10/10
232	67	HZ 1080M B	24/AZ 13-770
232	67	HZ 1180M D	14/AZ 20-800-10/10
232	66	HZ 1180M D	14/AZ 13-770
232	68	HZ 1080M B	24/AZ 14-770-10/10
233	72	HZ 1080M D	14/AZ 26
233	67	HZ 1180M D	14/AZ 14-770-10/10

$W_{el,y}$*	$G_{100\%}$	Section	Combination
in³/ft	lb/ft²		
234	71	HZ 1180M B	14/AZ 26-700
235	69	HZ 1080M B	24/AZ 25-800
235	73	HZ 1180M D	12/AZ 18-10/10
235	72	HZ 1080M A	24/AZ 26-700
235	69	HZ 1180M D	14/AZ 25-800
237	69	HZ 1180M A	14/AZ 18-10/10
239	78	HZ 1180M D	12/AZ 26
240	68	HZ 1180M C	14/AZ 13-700
240	69	HZ 1180M C	14/AZ 13-700-10/10
242	70	HZ 1180M C	14/AZ 28-750
242	74	HZ 1180M A	14/AZ 26
242	67	HZ 1080M A	26/AZ 20-800
243	72	HZ 1180M C	14/AZ 30-750
243	66	HZ 1080M A	26/AZ 13-770
243	68	HZ 1080M A	26/AZ 20-800-10/10
243	68	HZ 1080M A	26/AZ 14-770-10/10
244	74	HZ 1180M C	14/AZ 32-750
244	72	HZ 1080M A	24/AZ 18-10/10
244	69	HZ 1180M C	14/AZ 18-700
245	70	HZ 1080M B	24/AZ 13-700
245	71	HZ 1180M B	14/AZ 18-10/10
245	71	HZ 1080M B	24/AZ 13-700-10/10
245	70	HZ 1180M C	14/AZ 20-700
246	69	HZ 1080M A	26/AZ 25-800
246	72	HZ 1080M B	24/AZ 28-750
247	73	HZ 1080M B	24/AZ 30-750
248	75	HZ 1080M B	24/AZ 32-750
248	76	HZ 1080M A	24/AZ 26
248	70	HZ 1180M D	14/AZ 13-700
248	71	HZ 1080M B	24/AZ 18-700
248	71	HZ 1180M D	14/AZ 13-700-10/10
249	72	HZ 1080M B	24/AZ 20-700
249	72	HZ 1180M D	14/AZ 28-750
250	75	HZ 1180M C	14/AZ 26-700
250	75	HZ 1180M B	14/AZ 26
250	74	HZ 1180M D	14/AZ 30-750
251	72	HZ 1080M C	24/AZ 20-800
252	76	HZ 1180M D	14/AZ 32-750
252	73	HZ 1080M C	24/AZ 20-800-10/10
252	72	HZ 1080M C	24/AZ 13-770
252	71	HZ 1180M D	14/AZ 18-700
253	75	HZ 1080M B	24/AZ 26-700
253	73	HZ 1080M C	24/AZ 14-770-10/10
253	72	HZ 1180M D	14/AZ 20-700
254	75	HZ 1080M C	24/AZ 25-800
256	70	HZ 1080M A	26/AZ 13-700
257	71	HZ 1080M A	26/AZ 13-700-10/10
257	72	HZ 1080M A	26/AZ 28-750
258	77	HZ 1180M D	14/AZ 26-700
258	70	HZ 1080M B	26/AZ 20-800
258	73	HZ 1080M A	26/AZ 30-750
259	70	HZ 1080M B	26/AZ 20-800-10/10
259	69	HZ 1080M B	26/AZ 13-770
259	74	HZ 1080M A	26/AZ 32-750
260	70	HZ 1080M B	26/AZ 14-770-10/10
260	70	HZ 1080M A	26/AZ 18-700
261	72	HZ 1080M A	26/AZ 20-700
261	72	HZ 1080M B	26/AZ 25-800
262	75	HZ 1180M C	14/AZ 18-10/10
262	75	HZ 1080M B	24/AZ 18-10/10
264	75	HZ 1080M A	26/AZ 26-700
266	77	HZ 1080M C	24/AZ 28-750
266	76	HZ 1080M C	24/AZ 13-700
266	79	HZ 1080M B	24/AZ 26
266	76	HZ 1080M C	24/AZ 13-700-10/10
267	79	HZ 1180M C	14/AZ 26
267	79	HZ 1080M C	24/AZ 30-750
268	80	HZ 1080M C	24/AZ 32-750
270	76	HZ 1080M C	24/AZ 18-700
270	76	HZ 1080M D	24/AZ 20-800
270	77	HZ 1080M D	24/AZ 20-800-10/10
270	77	HZ 1080M C	24/AZ 20-700
271	77	HZ 1180M D	14/AZ 18-10/10
271	76	HZ 1080M D	24/AZ 13-770
272	77	HZ 1080M D	24/AZ 14-770-10/10
273	79	HZ 1080M D	24/AZ 25-800
274	73	HZ 1080M B	26/AZ 13-700
274	74	HZ 1080M B	26/AZ 13-700-10/10
274	75	HZ 1080M B	26/AZ 28-750
274	81	HZ 1080M C	24/AZ 26-700
275	75	HZ 1080M A	26/AZ 18-10/10
275	76	HZ 1080M B	26/AZ 30-750
275	81	HZ 1180M D	14/AZ 26
276	77	HZ 1080M B	26/AZ 32-750
277	73	HZ 1080M B	26/AZ 18-700
278	75	HZ 1080M C	26/AZ 20-800
278	75	HZ 1080M B	26/AZ 20-700
278	75	HZ 1080M C	26/AZ 20-800-10/10
279	79	HZ 1080M A	26/AZ 26
279	75	HZ 1080M C	26/AZ 13-770
279	76	HZ 1080M C	26/AZ 14-770-10/10
281	77	HZ 1080M C	26/AZ 25-800
282	78	HZ 1080M B	26/AZ 26-700
283	80	HZ 1180M A	24/AZ 20-800
283	80	HZ 1180M A	24/AZ 20-800-10/10
285	80	HZ 1180M A	24/AZ 13-770
285	81	HZ 1180M A	24/AZ 14-770-10/10
285	81	HZ 1080M C	24/AZ 18-10/10
285	82	HZ 1080M D	24/AZ 28-750
286	82	HZ 1180M A	24/AZ 25-800
286	80	HZ 1080M D	24/AZ 13-700
286	81	HZ 1080M D	24/AZ 13-700-10/10
286	83	HZ 1080M D	24/AZ 30-750
287	84	HZ 1080M D	24/AZ 32-750
289	85	HZ 1080M C	24/AZ 26
290	81	HZ 1080M D	24/AZ 18-700
290	82	HZ 1080M D	24/AZ 20-700
293	78	HZ 1080M B	26/AZ 18-10/10
294	80	HZ 1080M C	26/AZ 28-750
294	85	HZ 1080M D	24/AZ 26-700
294	82	HZ 1180M B	24/AZ 20-800
295	79	HZ 1080M C	26/AZ 13-700
295	82	HZ 1180M B	24/AZ 20-800-10/10
295	79	HZ 1080M C	26/AZ 13-700-10/10
295	81	HZ 1080M C	26/AZ 30-750
296	79	HZ 1080M D	26/AZ 20-800
296	82	HZ 1080M C	26/AZ 32-750
296	82	HZ 1180M B	24/AZ 13-770
296	80	HZ 1080M D	26/AZ 20-800-10/10
297	83	HZ 1180M B	24/AZ 14-770-10/10
297	82	HZ 1080M B	26/AZ 26
297	84	HZ 1180M B	24/AZ 25-800
298	79	HZ 1080M D	26/AZ 13-770
298	79	HZ 1080M C	26/AZ 18-700
298	80	HZ 1080M D	26/AZ 14-770-10/10
299	80	HZ 1080M C	26/AZ 20-700
299	81	HZ 1080M D	26/AZ 25-800
299	85	HZ 1180M A	24/AZ 28-750
300	86	HZ 1180M A	24/AZ 30-750
300	84	HZ 1180M A	24/AZ 13-700
301	84	HZ 1180M A	24/AZ 13-700-10/10
301	88	HZ 1180M A	24/AZ 32-750
303	83	HZ 1080M C	26/AZ 26-700
304	84	HZ 1180M A	24/AZ 18-700
304	86	HZ 1180M A	24/AZ 20-700
306	86	HZ 1080M D	24/AZ 18-10/10
308	89	HZ 1180M A	24/AZ 26-700
309	82	HZ 1180M A	26/AZ 20-800
309	83	HZ 1180M A	26/AZ 20-800-10/10
310	90	HZ 1080M D	24/AZ 26
311	87	HZ 1180M B	24/AZ 28-750
311	82	HZ 1180M A	26/AZ 13-770
311	83	HZ 1180M A	26/AZ 14-770-10/10
312	88	HZ 1180M B	24/AZ 30-750
312	84	HZ 1180M A	26/AZ 25-800
313	84	HZ 1080M D	26/AZ 28-750
313	86	HZ 1180M B	24/AZ 13-700
313	90	HZ 1180M B	24/AZ 32-750
313	87	HZ 1180M B	24/AZ 13-700-10/10
313	86	HZ 1180M C	24/AZ 20-800
314	85	HZ 1080M D	26/AZ 30-750
314	87	HZ 1180M C	24/AZ 20-800-10/10
314	83	HZ 1080M D	26/AZ 13-700
314	84	HZ 1080M D	26/AZ 13-700-10/10
315	87	HZ 1080M D	26/AZ 32-750
315	84	HZ 1080M C	26/AZ 18-10/10

$W_{el,y}$*	$G_{100\%}$	Section	Combination
in³/ft	lb/ft²		
316	86	**HZ 1180M C**	24/AZ 13-770
316	86	**HZ 1180M B**	24/AZ 18-700
316	87	**HZ 1180M C**	24/AZ 14-770-10/10
316	88	**HZ 1180M C**	24/AZ 25-800
317	88	**HZ 1180M B**	24/AZ 20-700
318	83	**HZ 1080M D**	26/AZ 18-700
318	85	**HZ 1080M D**	26/AZ 20-700
319	88	**HZ 1080M C**	26/AZ 26
320	84	**HZ 1180M B**	26/AZ 20-800
320	91	**HZ 1180M B**	24/AZ 26-700
320	85	**HZ 1180M B**	26/AZ 20-800-10/10
321	90	**HZ 1180M A**	24/AZ 18-10/10
322	88	**HZ 1080M D**	26/AZ 26-700
322	84	**HZ 1180M B**	26/AZ 13-770
323	85	**HZ 1180M B**	26/AZ 14-770-10/10
323	86	**HZ 1180M B**	26/AZ 25-800
325	93	**HZ 1180M A**	24/AZ 26
325	89	**HZ 1180M D**	24/AZ 20-800
326	90	**HZ 1180M D**	24/AZ 20-800-10/10
326	88	**HZ 1180M A**	26/AZ 28-750
327	89	**HZ 1180M A**	26/AZ 30-750
328	90	**HZ 1180M A**	26/AZ 32-750
328	89	**HZ 1180M D**	24/AZ 13-770
328	87	**HZ 1180M A**	26/AZ 13-700
328	91	**HZ 1180M D**	24/AZ 25-800
328	87	**HZ 1180M A**	26/AZ 13-700-10/10
329	90	**HZ 1180M D**	24/AZ 14-770-10/10
331	92	**HZ 1180M C**	24/AZ 28-750
332	93	**HZ 1180M C**	24/AZ 30-750
332	87	**HZ 1180M A**	26/AZ 18-700
332	88	**HZ 1180M A**	26/AZ 20-700
333	94	**HZ 1180M C**	24/AZ 32-750
334	91	**HZ 1180M C**	24/AZ 13-700
334	91	**HZ 1180M C**	24/AZ 13-700-10/10
334	92	**HZ 1180M B**	24/AZ 18-10/10
336	92	**HZ 1180M A**	26/AZ 26-700
336	89	**HZ 1080M D**	26/AZ 18-10/10
337	91	**HZ 1180M C**	24/AZ 18-700
337	92	**HZ 1180M C**	24/AZ 20-700
338	90	**HZ 1180M B**	26/AZ 28-750
338	96	**HZ 1180M B**	24/AZ 26
339	91	**HZ 1180M B**	26/AZ 30-750
340	92	**HZ 1180M B**	26/AZ 32-750
340	93	**HZ 1080M D**	26/AZ 26
340	89	**HZ 1180M B**	26/AZ 13-700
341	89	**HZ 1180M B**	26/AZ 13-700-10/10
341	96	**HZ 1180M C**	24/AZ 26-700
343	89	**HZ 1180M C**	26/AZ 20-800
343	95	**HZ 1180M D**	24/AZ 28-750
343	90	**HZ 1180M C**	26/AZ 20-800-10/10
344	89	**HZ 1180M B**	26/AZ 18-700
344	96	**HZ 1180M D**	24/AZ 30-750

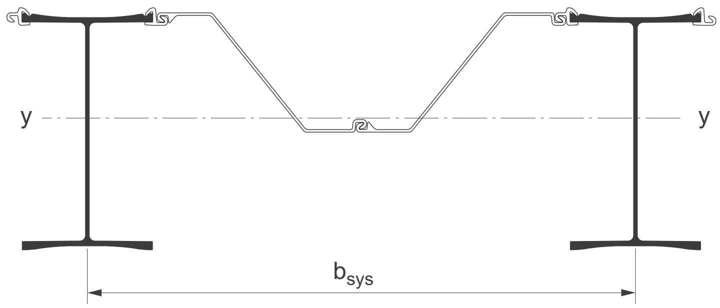
$W_{el,y}$*	$G_{100\%}$	Section	Combination
in³/ft	lb/ft²		
345	90	**HZ 1180M B**	26/AZ 20-700
345	97	**HZ 1180M D**	24/AZ 32-750
346	91	**HZ 1180M C**	26/AZ 25-800
346	89	**HZ 1180M C**	26/AZ 13-770
346	90	**HZ 1180M C**	26/AZ 14-770-10/10
346	94	**HZ 1180M D**	24/AZ 13-700
347	95	**HZ 1180M D**	24/AZ 13-700-10/10
348	94	**HZ 1180M B**	26/AZ 26-700
350	94	**HZ 1180M D**	24/AZ 18-700
350	96	**HZ 1180M D**	24/AZ 20-700
351	93	**HZ 1180M A**	26/AZ 18-10/10
354	99	**HZ 1180M D**	24/AZ 26-700
355	92	**HZ 1180M D**	26/AZ 20-800
355	96	**HZ 1180M A**	26/AZ 26
355	93	**HZ 1180M D**	26/AZ 20-800-10/10
357	97	**HZ 1180M C**	24/AZ 18-10/10
358	94	**HZ 1180M D**	26/AZ 25-800
358	92	**HZ 1180M D**	26/AZ 13-770
358	93	**HZ 1180M D**	26/AZ 14-770-10/10
360	101	**HZ 1180M C**	24/AZ 26
361	95	**HZ 1180M C**	26/AZ 28-750
362	96	**HZ 1180M C**	26/AZ 30-750
363	97	**HZ 1180M C**	26/AZ 32-750
364	95	**HZ 1180M B**	26/AZ 18-10/10
365	94	**HZ 1180M C**	26/AZ 13-700
365	95	**HZ 1180M C**	26/AZ 13-700-10/10
368	99	**HZ 1180M B**	26/AZ 26
369	95	**HZ 1180M C**	26/AZ 18-700
369	96	**HZ 1180M C**	26/AZ 20-700
370	100	**HZ 1180M D**	24/AZ 18-10/10
373	99	**HZ 1180M C**	26/AZ 26-700
374	98	**HZ 1180M D**	26/AZ 28-750
374	104	**HZ 1180M D**	24/AZ 26
375	99	**HZ 1180M D**	26/AZ 30-750
376	100	**HZ 1180M D**	26/AZ 32-750
378	97	**HZ 1180M D**	26/AZ 13-700
378	98	**HZ 1180M D**	26/AZ 13-700-10/10
381	98	**HZ 1180M D**	26/AZ 18-700
382	99	**HZ 1180M D**	26/AZ 20-700
386	102	**HZ 1180M D**	26/AZ 26-700
390	101	**HZ 1180M C**	26/AZ 18-10/10
394	104	**HZ 1180M C**	26/AZ 26
404	104	**HZ 1180M D**	26/AZ 18-10/10
407	108	**HZ 1180M D**	26/AZ 26


EBSARY

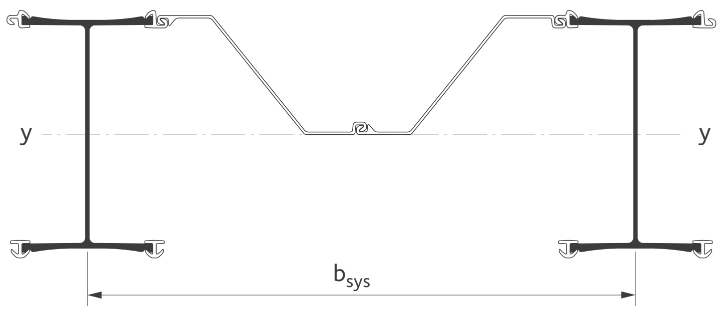
Trademarks
ArcelorMittal is the owner of following trademark applications or registered trademarks:
"AS 500", "AU", "AZ", "GU", "HZ", "PU", "AMLoCor", "AKILA", "Beltan", "ROXAN", "Arcoseal".
In communications and documents the symbol ™ or ® must follow the trademark on its first or most prominent instance, for example: AZ®, AU™.
Credit lines must be used on all communications and documents where a trademark is used, for example:
AZ is a trademark of ArcelorMittal group
AU, AZ and HZ are trademarks of ArcelorMittal group
AZ 25-800 is a steel sheet pile manufactured by ArcelorMittal group.

Edition 12.2023

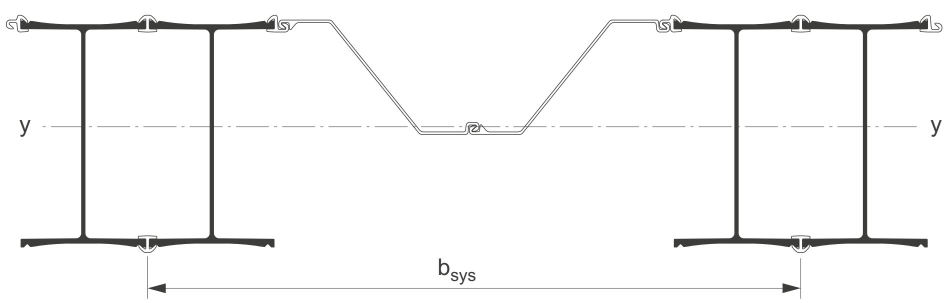
Combination 12



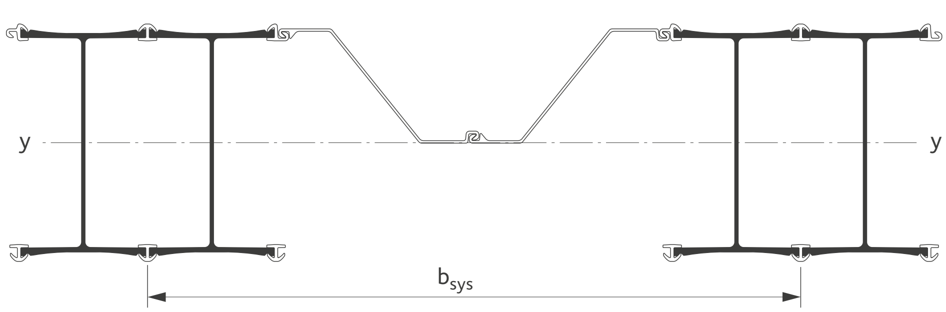
Combination 14



Combination 24



Combination 26



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