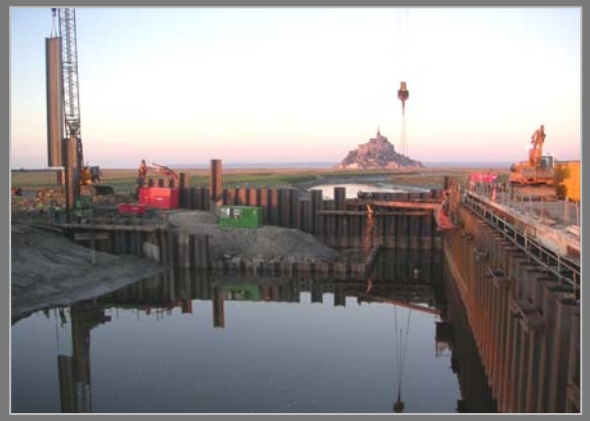
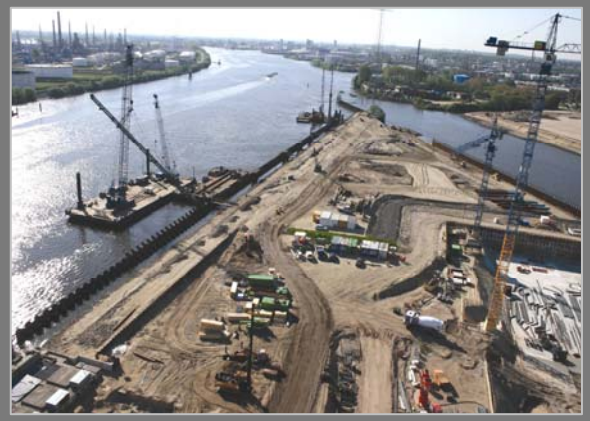
ArcelorMittal



New developments 2011-2012



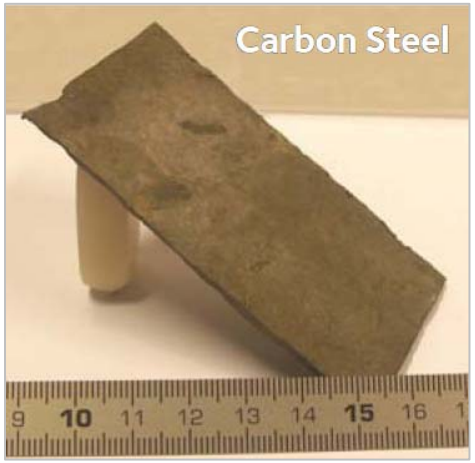
Steel Sheet Piles

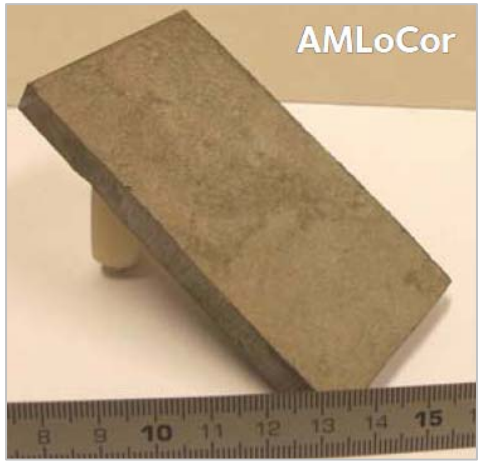
June 2012

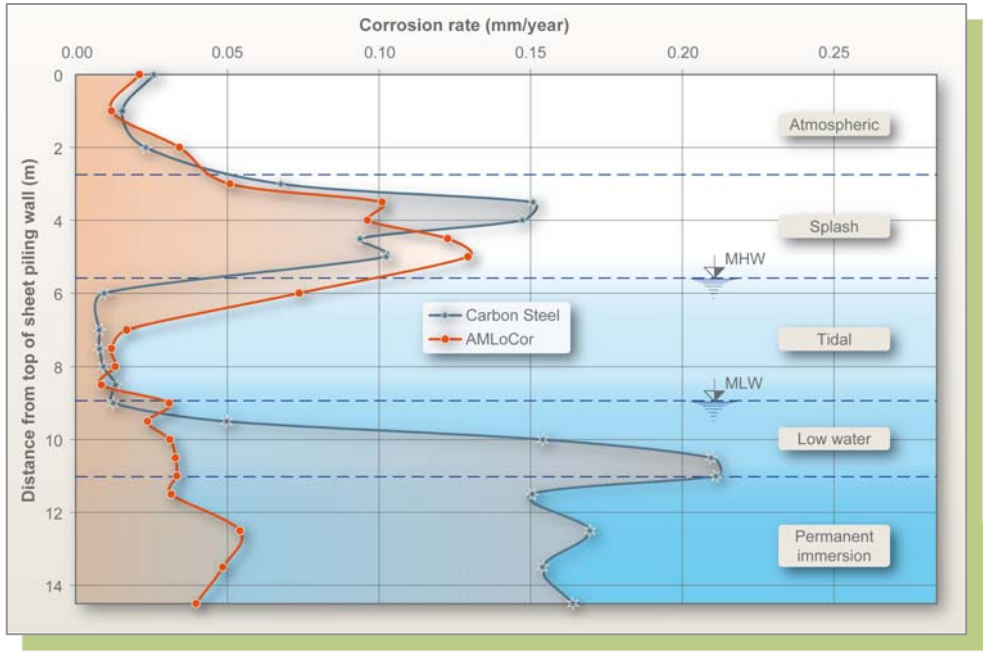
New steel grade. AMLoCor

Higher corrosion resistance
(special chemical composition)

CIR (corrosion impediment ratio)	
Low Water Zone	Permanent Immersion Zone
5	**3**

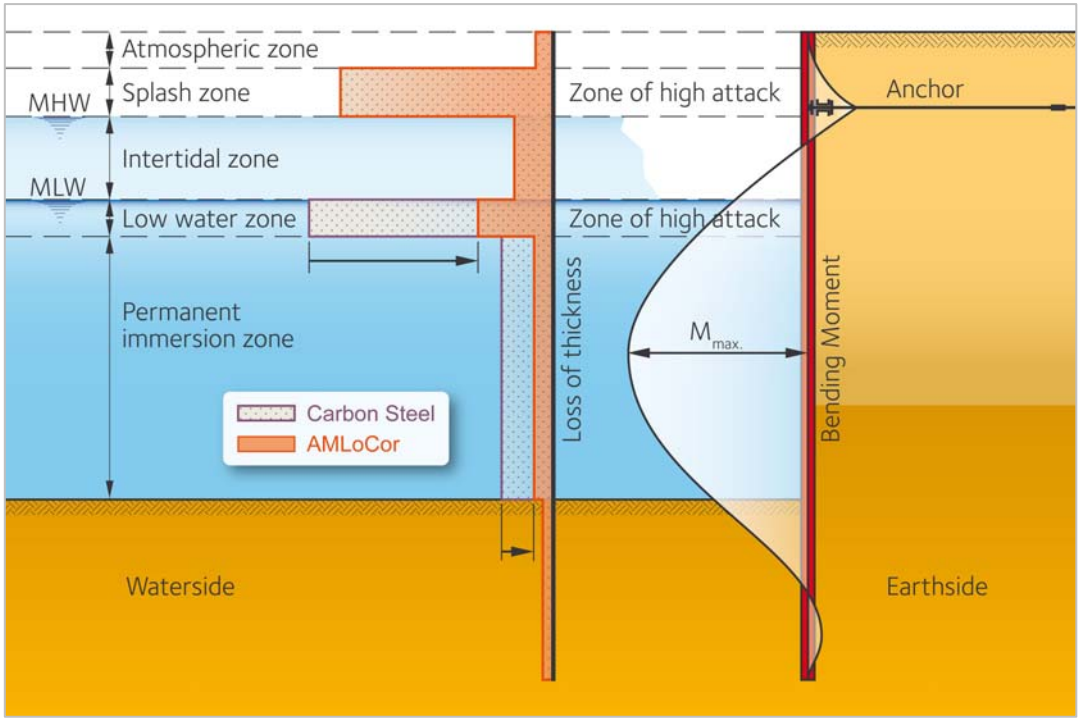






Measured corrosion rates in a port in UK (over 15 years)

New steel grade. AMLoCor

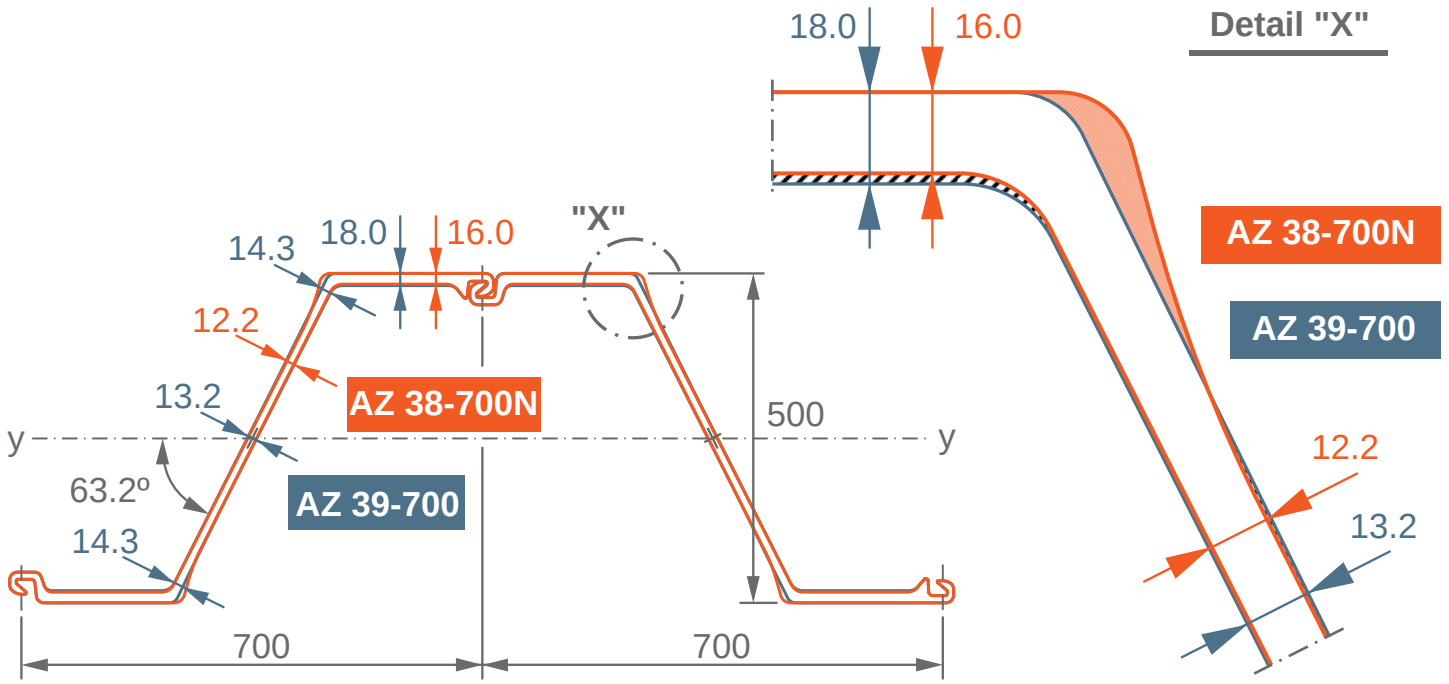


Section	b	h	t	s	G	$W_{y,el}$	Blue 320	Blue 355	Blue 390
	mm	mm	mm	mm	kg/m²	cm³/m			
AZ 26-700	700	460	12.2	12.2	147	2 600	✓	✓	✓
AZ 28-700	700	461	13.2	13.2	157	2 760	✓	✓	×
AZ 38-700N	700	500	16.0	12.2	181	3 795	✓	×	×
AZ 40-700N	700	501	17.0	13.2	192	3 995	✓	×	×
AZ 44-700N	700	500	19.0	15.0	214	4 405	✓	×	×
AZ 46-700N	700	501	20.0	16.0	225	4 605	✓	×	×
AZ 26	630	427	13.0	12.2	155	2 600	✓	✓	✓
AZ 28	630	428	14.0	13.2	166	2 755	✓	✓	×

currently available sections / steel grades

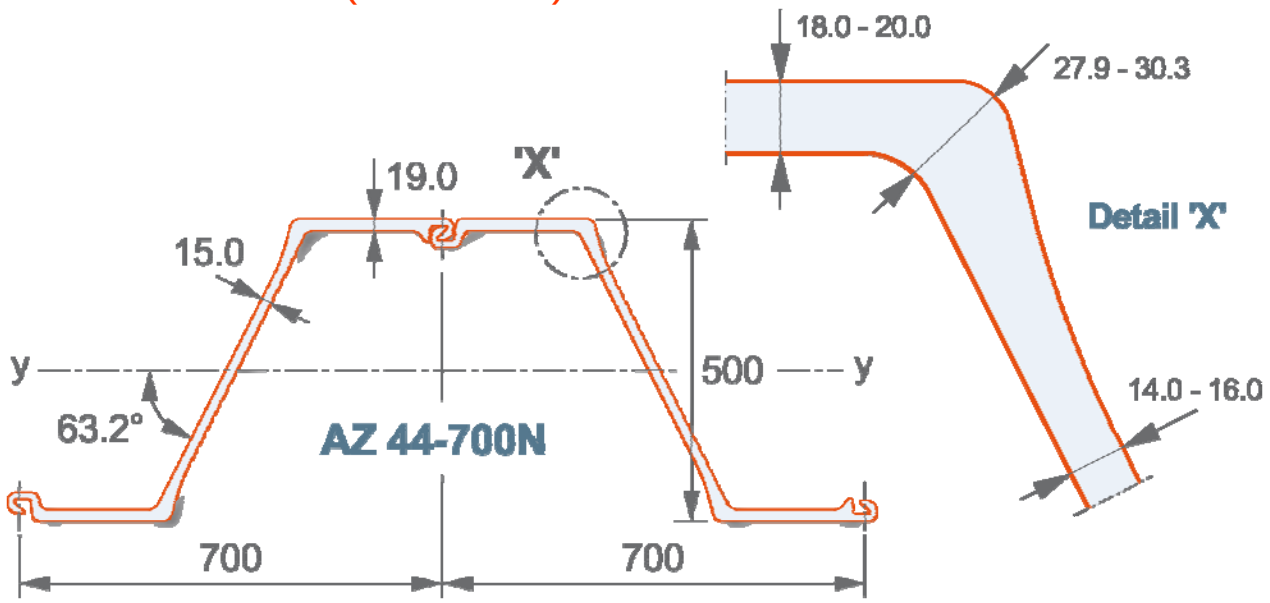
New AZ 38-700N (Jan. 2011)

	AZ 39-700	AZ 38-700N	
W_x (cm³/m)	3 900	3 795	
mass (kg/m²)	188.4	**180.6**	⇒ **- 4 %**



AZ 38-700N will replace the AZ 39-700

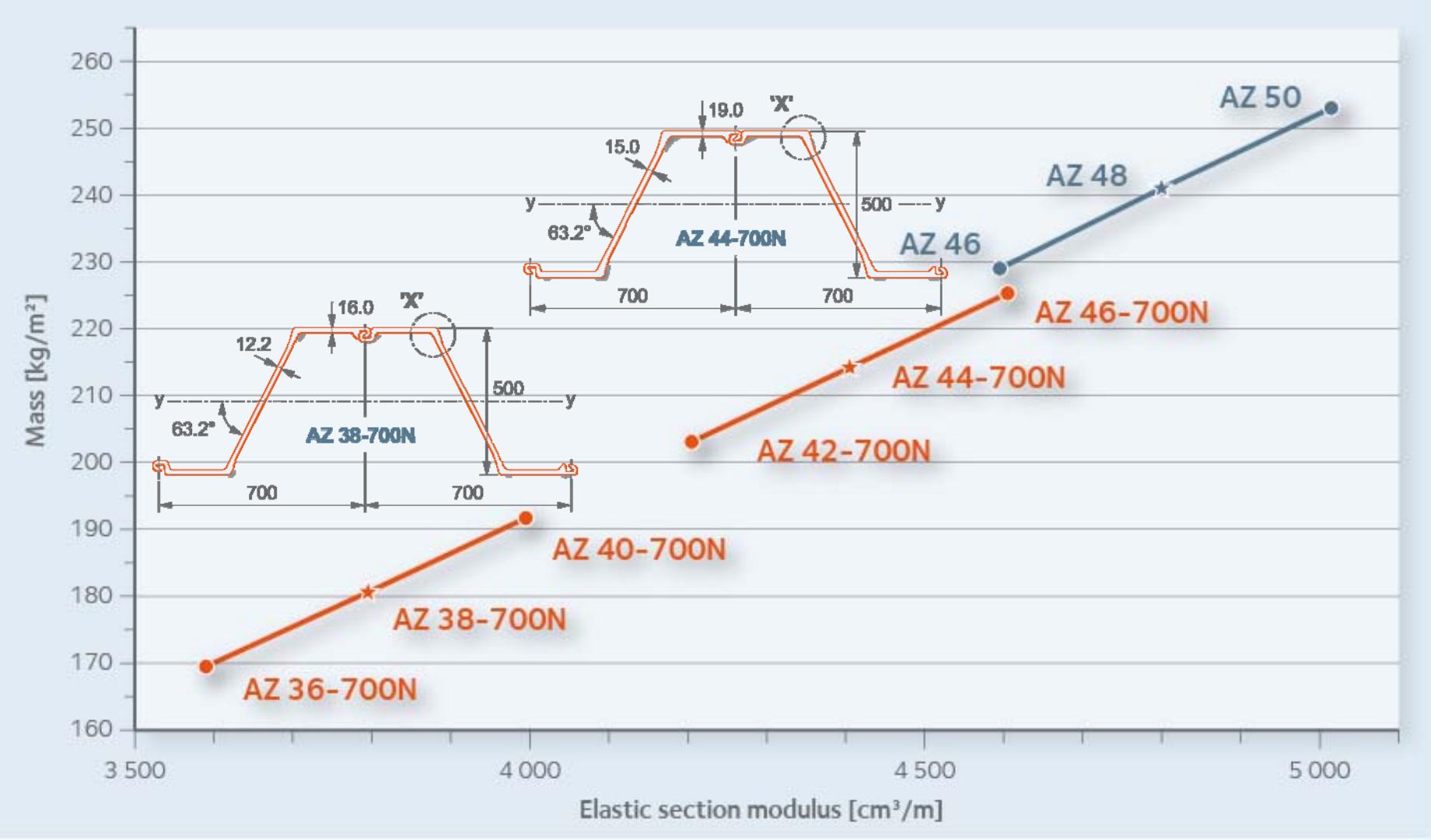
New range. AZ 44-700N (Nov. 2011)



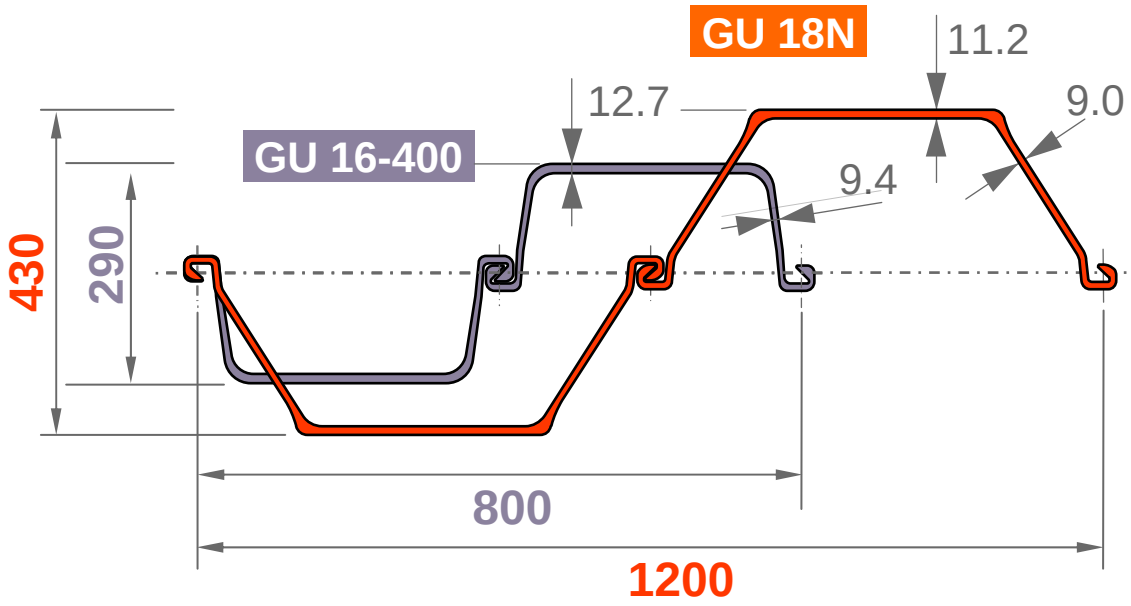
- first unique range of **4 400 cm³/m**
- thickness up to **20.0 mm**
- '**reinforced shoulders**'
  ⇒ hard driving conditions
- cost-effective solution for
  deep quay walls / deep excavations
- similar shape to AZ 38-700N
- completes AZ-700 range

	t (mm)	s (mm)	W_x (cm³/m)	G (kg/m²)
AZ 42-700N	18.0	14.0	**4 205**	203.1
AZ 44-700N	19.0	15.0	**4 405**	214.2
AZ 46-700N	20.0	16.0	**4 605**	225.3

High section modulus AZ sections



GU 18N (July 2011)



	GU 18N	GU 16-400
W_x (cm³/m)	1 800	1 560
mass (kg/m²)	128.2	154.9
Δmass	⇒ **- 17 %**	

	W_x (cm³/m)
GU 16N	1 670
GU 18N	**1 800**
GU 20N	1 920

GU 16N / GU 20N: upon request.

Steel grades up to S 430 GP: upon request

R&D. Akila. Compression joint (2012)

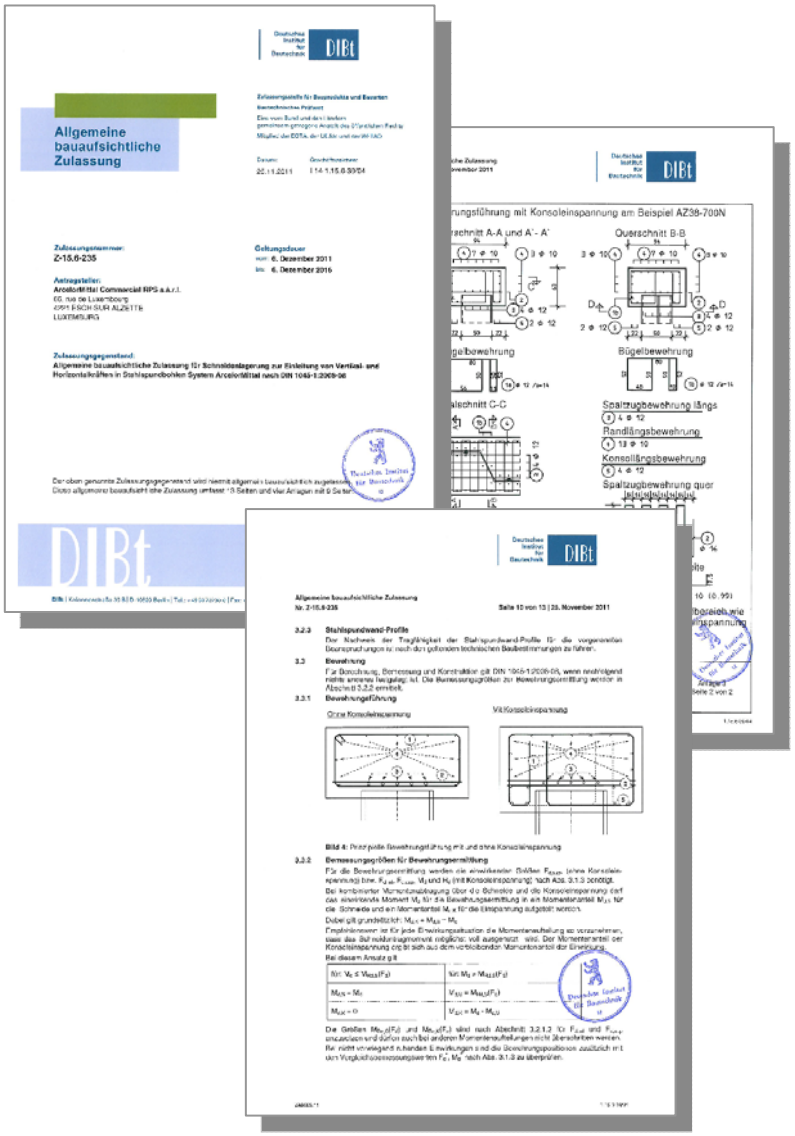
- new **environmentally friendly high performance sealant system**
- **compressive joint**
- **three sealing 'lips'**. The product is mechanically extruded into the sheet pile interlocks
- **silane modified polymers** (MS-Polymers)
- resists up to 30 m of water pressure (3 bars)
- can be used in contact with groundwater

	ρ_m (m/s)	
water pressure	200 kPa	300 kPa
single piles (MSP-1)	4.9×10^{-11}	8.6×10^{-11}
double piles (MSP-1 & MSP-2)	3.3×10^{-11}	4.7×10^{-11}

“AMRetain”
New design software from ArcelorMittal

- 2 modules: **Eurocodes** (**EC7-1 – French NAD**) & global safety approach
- implements design of main wall, anchor wall, and anchor lengths (based on method of “**Kranz**”, described in EAU2004)
- easy to use, state of the art design software (similar to RIDO), based on an ‘**subgrade reaction model**’ of the soil
- more adequate than existing ‘Prosheet’
- development done by AM R&D in collaboration with French design software company

‘Schneidenlagerung’ (2011)



- transmission of high vertical loads / bending moments at the top of sheet piles
- mainly for bridge abutments (design of capping beams)
- covers design method and typical execution of reinforcement of concrete capping beam
- German Technical Approval (AbaZ) from the DIBt (Germany) delivered in 12/2011

AM portfolio
Z-piles

ArcelorMittal

Z Sections	Width pair	Depth wall	Thickness		Sectional area	Mass		Moment of inertia	Elastic section modulus	Class to EN1993-5					
	2b	h	t	s		pair	wall			S270GP	S320GP	S355GP	S390GP	S430GP	S460AP
	mm	mm	mm	mm	cm²/m	kg/m	kg/m²	cm⁴/m	cm³/m						
AZ 12-770	1540	344	8.5	8.5	120	145.2	**94.3**	21430	**1245**	2	3	3	3	3	3
AZ 13-770	1540	344	9.0	9.0	126	152.1	**98.8**	22360	**1300**	2	3	3	3	3	3
AZ 14-770	1540	345	9.5	9.5	132	159.0	**103.2**	23300	**1355**	2	2	2	3	3	3
AZ 14-770-10/10	1540	345	10.0	10.0	137	165.8	**107.7**	24240	**1405**	2	2	2	2	3	3
AZ 17-700	1400	420	8.5	8.5	133	146.2	**104.4**	36230	**1730**	2	3	3	3	3	3
AZ 18-700	1400	420	9.0	9.0	139	153.0	**109.3**	37800	**1800**	2	3	3	3	3	3
AZ 19-700	1400	421	9.5	9.5	146	160.0	**114.3**	39380	**1870**	2	2	3	3	3	3
AZ 20-700	1400	421	10.0	10.0	152	167.0	**119.3**	40960	**1945**	2	2	2	2	3	3
AZ 24-700	1400	459	11.2	11.2	174	191.4	**136.7**	55820	**2430**	2	2	2	2	2	3
AZ 26-700	1400	460	12.2	12.2	187	205.7	**146.9**	59720	**2600**	2	2	2	2	2	2
AZ 28-700	1400	461	13.2	13.2	200	220.1	**157.2**	63620	**2760**	2	2	2	2	2	2
AZ 36-700N	1400	499	15.0	11.2	216	237.3	**169.5**	89610	**3590**	2	2	2	2	2	2
AZ 38-700N	1400	500	16.0	12.2	230	252.8	**180.6**	94840	**3795**	2	2	2	2	2	2
AZ 40-700N	1400	501	17.0	13.2	244	268.4	**191.7**	100080	**3995**	2	2	2	2	2	2
AZ 42-700N	1400	499	18.0	14.0	259	284.3	**203.1**	104930	**4205**	2	2	2	2	2	2
AZ 44-700N	1400	500	19.0	15.0	273	299.8	**214.2**	110150	**4405**	2	2	2	2	2	2
AZ 46-700N	1400	501	20.0	16.0	287	315.4	**225.3**	115370	**4605**	2	2	2	2	2	2
AZ 12	1340	302	8.5	8.5	126	132.2	**98.7**	18140	**1200**	3	3	3	3	3	3
AZ 13	1340	303	9.5	9.5	137	144.0	**107.5**	19700	**1300**	2	2	3	3	3	3
AZ 13-10/10	1340	304	10.0	10.0	143	150.4	**112.2**	20480	**1350**	2	2	2	3	3	3
AZ 14	1340	304	10.5	10.5	149	156.6	**116.9**	21300	**1400**	2	2	2	2	3	3
AZ 17	1260	379	8.5	8.5	138	136.8	**108.6**	31580	**1665**	2	3	3	3	3	3
AZ 18	1260	380	9.5	9.5	150	148.8	**118.1**	34200	**1800**	2	2	3	3	3	3
AZ 18-10/10	1260	381	10.0	10.0	157	155.5	**123.4**	35540	**1870**	2	2	2	3	3	3
AZ 19	1260	381	10.5	10.5	164	162.0	**128.6**	36980	**1940**	2	2	2	2	3	3
AZ 25	1260	426	12.0	11.2	185	183.0	**145.2**	52250	**2455**	2	2	2	2	2	2
AZ 26	1260	427	13.0	12.2	198	195.6	**155.2**	55510	**2600**	2	2	2	2	2	2
AZ 28	1260	428	14.0	13.2	211	208.8	**165.7**	58940	**2755**	2	2	2	2	2	2
AZ 46	1160	481	18.0	14.0	291	265.2	**228.6**	110450	**4595**	2	2	2	2	2	2
AZ 48	1160	482	19.0	15.0	307	279.2	**240.6**	115670	**4800**	2	2	2	2	2	2
AZ 50	1160	483	20.0	16.0	322	293.4	**252.9**	121060	**5015**	2	2	2	2	2	2

AM portfolio
U-piles

ArcelorMittal

U Sections	Width single pile	Depth wall	Thickness		Sectional area	Mass		Moment of inertia	Elastic section modulus	Class to EN1993-5					
	b	h	t	s		single pile	wall			S270GP	S320GP	S355GP	S390GP	S430GP	S460AP
	mm	mm	mm	mm	cm²/m	kg/m	kg/m²	cm⁴/ m	cm³/m						
AU 14	750	408	10.0	8.3	132	77.9	103.8	28680	1405	2	3	3	3	3	3
AU 16	750	411	11.5	9.3	147	86.3	115.0	32850	1600	2	2	2	2	3	3
AU 17	750	412	12.0	9.7	151	89.0	118.7	34270	1665	2	2	2	2	2	3
AU 18	750	441	10.5	9.1	150	88.5	118.0	39300	1780	3	3	3	3	3	3
AU 20	750	444	12.0	10.0	165	96.9	129.2	44440	2000	2	2	3	3	3	3
AU 21	750	445	12.5	10.3	169	99.7	132.9	46180	2075	2	2	2	3	3	3
AU 23	750	447	13.0	9.5	173	102.1	136.1	50700	2270	2	2	3	3	3	3
AU 25	750	450	14.5	10.2	188	110.4	147.2	56240	2500	2	2	2	2	3	3
AU 26	750	451	15.0	10.5	192	113.2	150.9	58140	2580	2	2	2	2	2	3
PU 7S	600	281	7.0	6.6	99	46.6	77.7	10220	725	4	4	4	4	4	4
PU 8S	600	283	8.0	8.0	112	52.8	87.9	11930	845	3	3	4	4	4	4
PU 12	600	360	9.8	9.0	140	66.1	110.1	21600	1200	2	2	2	2	2	3
PU 12-10/10	600	360	10.0	10.0	148	69.6	116.0	22580	1255	2	2	2	2	2	2
PU 18^{-1}	600	430	10.2	8.4	154	72.6	121.0	35950	1670	2	2	2	2	3	3
PU 18	600	430	11.2	9.0	163	76.9	128.2	38650	1800	2	2	2	2	2	2
PU 18^{+1}	600	430	12.2	9.5	172	81.1	135.2	41320	1920	2	2	2	2	2	2
PU 22^{-1}	600	450	11.1	9.0	174	81.9	136.5	46380	2060	2	2	2	2	2	2
PU 22	600	450	12.1	9.5	183	86.1	143.6	49460	2200	2	2	2	2	2	2
PU 22^{+1}	600	450	13.1	10.0	192	90.4	150.7	52510	2335	2	2	2	2	2	2
PU 28^{-1}	600	452	14.2	9.7	207	97.4	162.3	60580	2680	2	2	2	2	2	2
PU 28	600	454	15.2	10.1	216	101.8	169.6	64460	2840	2	2	2	2	2	2
PU 28^{+1}	600	456	16.2	10.5	226	106.2	177.1	68380	3000	2	2	2	2	2	2
PU 32	600	452	19.5	11.0	242	114.1	190.2	72320	3200	2	2	2	2	2	2
GU 6N	600	309	6.0	6.0	89	41.9	69.9	9670	625	3	3	4	4	4	×
GU 7N	600	310	6.5	6.4	94	44.1	73.5	10450	675	3	3	3	3	4	×
GU 7S	600	311	7.2	6.9	100	46.3	77.1	11540	740	2	3	3	3	3	×
GU 8N	600	312	7.5	7.1	103	48.5	80.9	12010	770	2	3	3	3	3	×
GU 8S	600	313	8.0	7.5	108	50.8	84.6	12800	820	2	2	3	3	3	×
GU 16N	600	430	10.2	8.4	154	72.6	121.0	35950	1670	2	2	2	2	3	×
GU 18N	600	430	11.2	9.0	163	76.9	128.2	38650	1800	2	2	2	2	2	×
GU 20N	600	430	12.2	9.5	172	81.1	135.2	41320	1920	2	2	2	2	2	×
GU 16-400	400	290	12.7	9.4	197	62.0	154.9	22580	1560	2	2	2	2	2	×
GU 18-400	400	292	15.0	9.7	221	69.3	173.3	26090	1785	2	2	2	2	2	×

Steel grades

		EN 10248						Mill	ASTM	
		S 240 GP	S 270 GP	S 320 GP	S 355 GP	S 390 GP	S 430 GP	S 460 A P	A 572	A 690
Belval	**AZ-770/700**	✓	✓	✓	✓	✓	✓	✓	✓	✓
	AZ	✓	✓	✓	✓	✓	✓	✓	✓	✓
	AU	✓	✓	✓	✓	✓	✓	✓	✓	✓
	PU	✓	✓	✓	✓	✓	✓	✓	✓	✓
Dabrowa	GU 6N	✓	✓	✓	✓	✓	✓	×	×	×
	GU 7N	✓	✓	✓	✓	✓	✓	×	×	×
	GU 7S	✓	✓	✓	✓	✓	✓	×	×	×
	GU 8N	✓	✓	✓	✓	✓	✓	×	×	×
	GU 8S	✓	✓	✓	✓	✓	✓	×	×	×
	GU 16N	✓	✓	✓	✓	✓	×	×	×	×
	GU 18N	✓	✓	✓	✓	✓	×	×	×	×
	GU 20N	✓	✓	✓	✓	✓	×	×	×	×
	GU 16-400	✓	✓	✓	✓	✓	✓	×	×	×
	GU 18-400	✓	✓	✓	✓	✓	✓	×	×	×

		Mill		
		AMLoCor		
		Blue 320	Blue 355	Blue 390
Belval	AZ 26-700	✓	✓	✓
	AZ 28-700	✓	✓	×
	AZ 38-700N	✓	×	×
	AZ 40-700N	✓	×	×
	AZ 44-700N	✓	×	×
	AZ 46-700N	✓	×	×
	AZ 26	✓	✓	✓
	AZ 28	✓	✓	×

Notes

✓ available

× currently unavailable