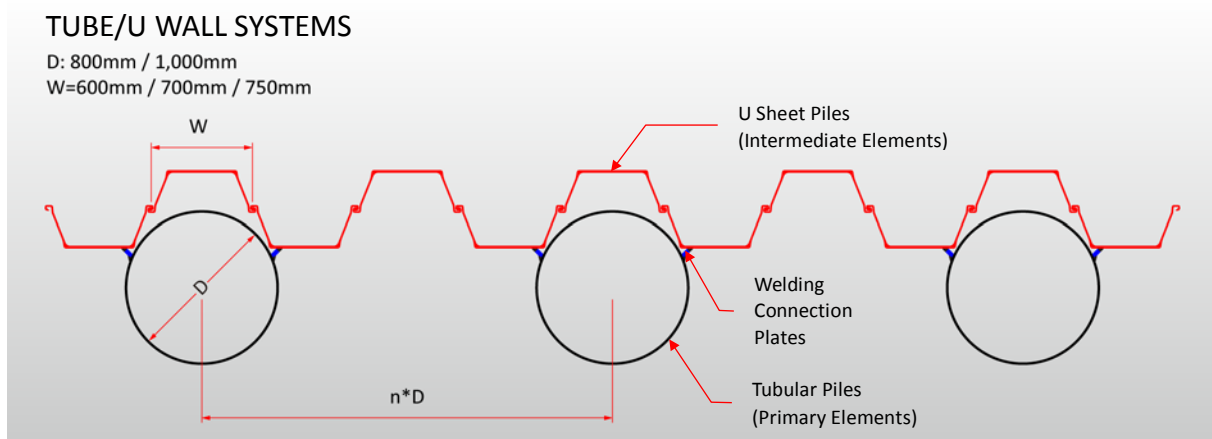


COMBI-GYRO WALL SYSTEM

- High Modulus Steel Combined Wall -

Wall Properties (Tube / U)



The combination of the primary piles and intermediate piles acts as "a built-up beam structure" and combined wall profiles can be calculated as follows:-

1-1 Combined Elastic Section Modulus

$$Z_{sys} = Z_{stp} + Z_{ssp}$$

Z_{sys} : Elastic Section Modulus of System

Z_{stp} : Elastic Section Modulus of Steel Tubular Piles

Z_{ssp} : Elastic Section Modulus of Steel Sheet Piles

1-2 Combined Moment of Inertia

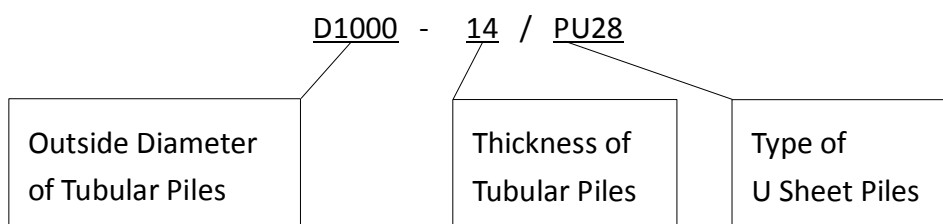
$$I_{sys} = I_{stp} + I_{ssp}$$

I_{sys} : Moment of Inertia of System

I_{stp} : Moment of Inertia of Steel Tubular Piles

I_{ssp} : Moment of Inertia of Steel Sheet Piles

1-3 Denomination of the Combi-Gyro Wall System



1-4 Wall Properties of Combi-Gyro Wall

1-4-1 Tube / U Wall (600 mm wide U sheet pile)

1. Tubular Piles

Type of Pile	Steel Tubular Piles n=2 (1200mm c/c)							
	Outside Diameter (mm)	Wall Thickness (mm)	Spacing (mm)	Section Modulus Z (cm ³)	Section Modulus Z (cm ³ /m)	Moment of Inertia I (cm ⁴)	Moment of Inertia I (cm ⁴ /m)	Mass per m ² of Wall (kg/m ²)
D800-10	800	10	1200	4841	4034	193647	161372	162.4
D800-12	800	12	1200	5766	4805	230632	192194	194.3
D800-14	800	14	1200	6676	5564	267050	222542	226.1
D800-16	800	16	1200	7573	6311	302907	252422	257.8
D1000-12	1000	12	1200	9091	7576	454544	378787	243.7
D1000-14	1000	14	1200	10542	8785	527116	439263	283.7
D1000-16	1000	16	1200	11976	9980	598797	498998	323.6
D1000-18	1000	18	1200	13392	11160	669596	557997	363.3
D1000-20	1000	20	1200	14790	12325	739518	616265	402.8
D1000-22	1000	22	1200	16171	13476	808572	673810	442.2

Type of Pile	Steel Tubular Piles n=4 (2400mm c/c)							
	Outside Diameter (mm)	Wall Thickness (mm)	Spacing (mm)	Section Modulus Z (cm ³)	Section Modulus Z (cm ³ /m)	Moment of Inertia I (cm ⁴)	Moment of Inertia I (cm ⁴ /m)	Mass per m ² of Wall (kg/m ²)
D800-10	800	10	2400	4841	2017	193647	80686	81.2
D800-12	800	12	2400	5766	2402	230632	96097	97.2
D800-14	800	14	2400	6676	2782	267050	111271	113.1
D800-16	800	16	2400	7573	3155	302907	126211	128.9
D1000-12	1000	12	2400	9091	3788	454544	189393	121.8
D1000-14	1000	14	2400	10542	4393	527116	219632	141.8
D1000-16	1000	16	2400	11976	4990	598797	249499	161.8
D1000-18	1000	18	2400	13392	5580	669596	278998	181.6
D1000-20	1000	20	2400	14790	6163	739518	308133	201.4
D1000-22	1000	22	2400	16171	6738	808572	336905	221.1

2. Sheet Piles

Type of Pile	U Sheet Piles (Arcelor Mittal)						
	Pile Width (mm)	Wall Height (mm)	Section Modulus Z (cm ³)	Section Modulus Z (cm ³ /m)	Moment of Inertia I (cm ⁴)	Moment of Inertia I (cm ⁴ /m)	Mass per m ² of Wall (kg/m ²)
PU12	600	360	370	1200	4500	21600	110.1
PU18	600	430	484	1800	7220	38650	128.2
PU22	600	450	546	2200	8740	49460	143.6
PU28	600	454	589	2840	10070	64460	169.6
PU32	600	452	633	3200	10950	72320	190.2
GU14N	600	420	410	1400	5750	29410	107.1
GU22N	600	450	546	220	8740	49460	143.6
GU28N	600	454	589	2840	10070	64460	169.6
GU32N	600	452	633	3200	10950	72320	190.2

Type of Pile	U Sheet Piles (Hoesch)						
	Pile Width (mm)	Wall Height (mm)	Section Modulus Z (cm ³)	Section Modulus Z (cm ³ /m)	Moment of Inertia I (cm ⁴)	Moment of Inertia I (cm ⁴ /m)	Mass per m ² of Wall (kg/m ²)
603	600	310	330	1200	3830	18600	108.0
604n	600	380	415	1600	5700	30400	123.0
605	600	420	520	2020	7910	42420	139.2
606n	600	435	605	2500	9870	54375	157.0
628	600	456	586	2775	10030	63270	165.5
607n	600	452	649	3200	11280	72320	190.0

1-4-2 Tube / U Wall (700 mm wide U sheet pile)

1. Tubular Piles

Type of Pile	Steel Tubular Piles n=2 (1400mm c/c)							
	Outside Diameter (mm)	Wall Thickness (mm)	Spacing (mm)	Section Modulus Z (cm ³)	Section Modulus Z (cm ³ /m)	Moment of Inertia I (cm ⁴)	Moment of Inertia I (cm ⁴ /m)	Mass per m ² of Wall (kg/m ²)
D800-10	800	10	1400	4841	3458	193647	138319	139.2
D800-12	800	12	1400	5766	4118	230632	164737	166.6
D800-14	800	14	1400	6676	4769	267050	190750	193.8
D800-16	800	16	1400	7573	5409	302907	216362	221.0
D1000-12	1000	12	1400	9091	6493	454544	324674	208.8
D1000-14	1000	14	1400	10542	7530	527116	376511	243.2
D1000-16	1000	16	1400	11976	8554	598797	427712	277.3
D1000-18	1000	18	1400	13392	9566	669596	478283	311.4
D1000-20	1000	20	1400	14790	10565	739518	528227	345.3
D1000-22	1000	22	1400	16171	11551	808572	577552	379.0

Type of Pile	Steel Tubular Piles n=4 (2800mm c/c)							
	Outside Diameter (mm)	Wall Thickness (mm)	Spacing (mm)	Section Modulus Z (cm ³)	Section Modulus Z (cm ³ /m)	Moment of Inertia I (cm ⁴)	Moment of Inertia I (cm ⁴ /m)	Mass per m ² of Wall (kg/m ²)
D800-10	800	10	2800	4841	1729	193647	69160	69.6
D800-12	800	12	2800	5766	2059	230632	82369	83.3
D800-14	800	14	2800	6676	2384	267050	95375	96.9
D800-16	800	16	2800	7573	2705	302907	108181	110.5
D1000-12	1000	12	2800	9091	3247	454544	162337	104.4
D1000-14	1000	14	2800	10542	3765	527116	188256	121.6
D1000-16	1000	16	2800	11976	4277	598797	213856	138.7
D1000-18	1000	18	2800	13392	4783	669596	239141	155.7
D1000-20	1000	20	2800	14790	5282	739518	264114	172.6
D1000-22	1000	22	2800	16171	5776	808572	288776	189.5

2. Sheet Piles

Type of Pile	U Sheet Piles (Hoesch)						
	Pile Width (mm)	Wall Height (mm)	Section Modulus Z (cm ³)	Section Modulus Z (cm ³ /m)	Moment of Inertia I (cm ⁴)	Moment of Inertia I (cm ⁴ /m)	Mass per m ² of Wall (kg/m ²)
703	700	400	414	1210	5630	24200	96.4
703K	700	400	426	1300	5830	25950	103.0
716	700	440	551	1600	7690	35200	114.2

1-4-3 Tube / U Wall (750 mm wide U sheet pile)

1. Tubular Piles

Type of Pile	Steel Tubular Piles n=2 (1500mm c/c)							
	Outside Diameter (mm)	Wall Thickness (mm)	Spacing (mm)	Section Modulus Z (cm ³)	Section Modulus Z (cm ³ /m)	Moment of Inertia I (cm ⁴)	Moment of Inertia I (cm ⁴ /m)	Mass per m ² of Wall (kg/m ²)
D800-10	800	10	1500	4841	3227	193647	129098	129.9
D800-12	800	12	1500	5766	3844	230632	153755	155.5
D800-14	800	14	1500	6676	4451	267050	178034	180.9
D800-16	800	16	1500	7573	5048	302907	201938	206.2
D1000-12	1000	12	1500	9091	6061	454544	303029	194.9
D1000-14	1000	14	1500	10542	7028	527116	351411	227.0
D1000-16	1000	16	1500	11976	7984	598797	399198	258.8
D1000-18	1000	18	1500	13392	8928	669596	446397	290.6
D1000-20	1000	20	1500	14790	9860	739518	493012	322.2
D1000-22	1000	22	1500	16171	10781	808572	539048	353.7

Type of Pile	Steel Tubular Piles n=4 (3000mm c/c)							
	Outside Diameter (mm)	Wall Thickness (mm)	Spacing (mm)	Section Modulus Z (cm ³)	Section Modulus Z (cm ³ /m)	Moment of Inertia I (cm ⁴)	Moment of Inertia I (cm ⁴ /m)	Mass per m ² of Wall (kg/m ²)
D800-10	800	10	3000	4841	1614	193647	64549	64.9
D800-12	800	12	3000	5766	1922	230632	76877	77.7
D800-14	800	14	3000	6676	2225	267050	89017	90.5
D800-16	800	16	3000	7573	2524	302907	100969	103.1
D1000-12	1000	12	3000	9091	3030	454544	151515	97.5
D1000-14	1000	14	3000	10542	3514	527116	175705	113.5
D1000-16	1000	16	3000	11976	3992	598797	199599	129.4
D1000-18	1000	18	3000	13392	4464	669596	223199	145.3
D1000-20	1000	20	3000	14790	4930	739518	246506	161.1
D1000-22	1000	22	3000	16171	5390	808572	269524	176.9

2. Sheet Piles

Type of Pile	U Sheet Piles (Arcelor Mittal)						
	Pile Width (mm)	Wall Height (mm)	Section Modulus Z (cm ³)	Section Modulus Z (cm ³ /m)	Moment of Inertia I (cm ⁴)	Moment of Inertia I (cm ⁴ /m)	Mass per m ² of Wall (kg/m ²)
AU14	750	408	456	1410	6590	28710	103.8
AU16	750	411	481	1600	7110	32850	115.0
AU18	750	441	554	1780	8760	39300	118.0
AU20	750	444	579	2000	9380	44440	129.2
AU23	750	447	579	2270	9830	50700	136.1
AU25	750	450	601	2500	10390	56240	147.2

Type of Pile	U Sheet Piles (Hoesch)						
	Pile Width (mm)	Wall Height (mm)	Section Modulus Z (cm ³)	Section Modulus Z (cm ³ /m)	Moment of Inertia I (cm ⁴)	Moment of Inertia I (cm ⁴ /m)	Mass per m ² of Wall (kg/m ²)
720	750	450	588	2000	9575	45000	128.5
720/14.5/10.0	750	450	595	2270	10015	51075	139.3

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