

## **Appendix 4**    **RR<sup>®</sup> and RD<sup>®</sup> piles** Design and installation manual

# **RR and RD piles**

## **Design resistance tables for RR and RD piles made of S440J2H steel grade**

6/2018

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Table 4A.  $R_{c,max}$  values of driven RR75 to RR320 piles, that is, maximum impact resistance values by piling classes.

Pile	Steel grade	PTL1	PTL2	PTL3
RR75	S440J2H	328	438	547
RR90	S440J2H	388	518	647
RR115/6.3	S440J2H	508	677	846
RR115/8	S440J2H	635	846	1058
RR140/8	S440J2H	786	1049	1311
RR140/10	S440J2H	968	1291	1614
RR170/10	S440J2H	1182	1575	1969
RR170/12.5	S440J2H	1454	1938	2423
RR220/10	S440J2H	1561	2081	2601
RR220/12.5	S440J2H	1928	2570	3213
RR270/10	S440J2H	1963	2617	3272
RR270/12.5	S440J2H	2431	3241	4051
RR320/10	S440J2H	2343	3124	3905
RR320/12.5	S440J2H	2905	3874	4842*

\* With RR320 standard rock shoes resistance of the rock shoe is lower (Sec. 2.3.3)

Table 4B. Design values for structural compressive resistances of RR piles and geotechnical resistances in different piling work classes. The compressive strength of the structure is dimensioned for a steel structure.

Corrosion allowance 1.2 mm											
Pile	Steel grade	Initial deflection $\delta_g$	Design value of structural compression resistance $R_d$ [kN]						Design values of geotechnical resistance $R_d$ [kN]		
			Undrained shear strength $c_{uk}$ [kPa]						PTL1	PTL2	PTL3
			5	7	10	15	20	30			
RR75	S440J2H	$L_{cr}/400$	210	257	318	347	364	383	186	220*	274*
		$L_{cr}/600$	245	298	337	365	381	399			
RR90	S440J2H	$L_{cr}/400$	274	336	394	424	442	463	220	260*	324*
		$L_{cr}/600$	320	382	414	445	462	481			
RR115/6.3	S440J2H	$L_{cr}/400$	421	507	544	579	599	622	288	345*	423*
		$L_{cr}/600$	489	534	571	605	624	645			
RR115/8	S440J2H	$L_{cr}/400$	464	568	673	726	758	794	360	480	600
		$L_{cr}/600$	541	652	709	762	792	826			
RR140/8	S440J2H	$L_{cr}/400$	653	799	872	931	966	1007	446	594	743
		$L_{cr}/600$	758	853	917	975	1008	1044			
RR140/10	S440J2H	$L_{cr}/400$	710	870	1052	1138	1190	1249	549	732	915
		$L_{cr}/600$	829	1007	1108	1195	1245	1301			
RR170/10	S440J2H	$L_{cr}/400$	975	1194	1341	1436	1493	1558	670	893	1116
		$L_{cr}/600$	1134	1307	1410	1504	1558	1618			
RR170/12.5	S440J2H	$L_{cr}/400$	1057	1295	1603	1739	1821	1917	824	1099	1373
		$L_{cr}/600$	1234	1501	1687	1826	1907	1992			
RR220/10	S440J2H	$L_{cr}/400$	1519	1747	1864	1973	2037	2111	885	1180	1475
		$L_{cr}/600$	1706	1838	1955	2060	2119	2187			
RR220/12.5	S440J2H	$L_{cr}/400$	1654	2026	2259	2417	2511	2620	1093	1457	1821
		$L_{cr}/600$	1922	2204	2374	2531	2620	2720			
RR270/10	S440J2H	$L_{cr}/400$	2152	2298	2429	2550	2621	2702	1113	1484	1855
		$L_{cr}/600$	2265	2413	2541	2654	2718	2790			
RR270/12.5	S440J2H	$L_{cr}/400$	2391	2782	2971	3149	3253	3373	1378	1837	2296
		$L_{cr}/600$	2713	2927	3117	3288	3384	3493			
RR320/10	S440J2H	$L_{cr}/400$	2665	2826	2969	3099	3176	3264	1328	1771	2214
		$L_{cr}/600$	2802	2962	3098	3219	3287	3364			
RR320/12.5	S440J2H	$L_{cr}/400$	3177	3446	3654	3847	3959	4089	1647	2196	2745
		$L_{cr}/600$	3386	3621	3826	4008	4110	4226			
Corrosion allowance 2.0 mm											
RR75	S440J2H	$L_{cr}/400$	191	234	276	297	310	325	186	220*	274*
		$L_{cr}/600$	223	267	290	312	324	338			
RR90	S440J2H	$L_{cr}/400$	251	308	339	363	376	392	220	260*	324*
		$L_{cr}/600$	292	331	357	380	393	407			
RR115/6.3	S440J2H	$L_{cr}/400$	388	439	468	494	510	528	288	345*	423*
		$L_{cr}/600$	429	462	490	515	530	546			
RR115/8	S440J2H	$L_{cr}/400$	435	532	605	648	673	704	360	480	600
		$L_{cr}/600$	506	588	635	678	703	731			
RR140/8	S440J2H	$L_{cr}/400$	613	730	781	830	859	892	446	594	743
		$L_{cr}/600$	710	768	820	867	894	924			
RR140/10	S440J2H	$L_{cr}/400$	675	827	969	1043	1088	1139	549	732	915
		$L_{cr}/600$	787	940	1019	1094	1137	1185			
RR170/10	S440J2H	$L_{cr}/400$	929	1138	1233	1316	1364	1421	670	893	1116
		$L_{cr}/600$	1079	1207	1296	1377	1422	1474			
RR170/12.5	S440J2H	$L_{cr}/400$	1016	1245	1504	1626	1700	1785	824	1099	1373
		$L_{cr}/600$	1185	1441	1583	1707	1778	1858			
RR220/10	S440J2H	$L_{cr}/400$	1451	1611	1712	1806	1861	1925	885	1180	1475
		$L_{cr}/600$	1579	1694	1794	1883	1934	1990			
RR220/12.5	S440J2H	$L_{cr}/400$	1594	1952	2118	2260	2343	2440	1093	1457	1821
		$L_{cr}/600$	1850	2073	2225	2364	2443	2531			
RR270/10	S440J2H	$L_{cr}/400$	1988	2115	2229	2333	2393	2464	1113	1484	1855
		$L_{cr}/600$	2092	2219	2329	2425	2480	2542			
RR270/12.5	S440J2H	$L_{cr}/400$	2308	2614	2783	2942	3034	3141	1378	1837	2296
		$L_{cr}/600$	2556	2749	2918	3069	3154	3250			
RR320/10	S440J2H	$L_{cr}/400$	2459	2599	2721	2834	2899	2976	1328	1771	2214
		$L_{cr}/600$	2584	2721	2837	2940	2998	3065			
RR320/12.5	S440J2H	$L_{cr}/400$	3028	3235	3421	3592	3692	3808	1647	2196	2745
		$L_{cr}/600$	3187	3397	3578	3739	3830	3932			

\*The given design values of geotechnical resistance for RR75, RR90 and RR115/6.3 are not maximum values of the piling class in question but design values recommended for ordinary sites. The maximum values of geotechnical resistance  $R_d$  for these piles in piling class PTL2 are 248 kN for RR75, 294 kN for RR90, and 384 kN for RR115/6.3.

Table 4C. Design values for structural compressive resistance of RD piles.

Pile	Steel grade	$\delta_\theta$	Dimensioned as a steel structure												Dimensioned as a composite structure C30/37					
			Corrosion allowance 1.2 mm						Corrosion allowance 2.0 mm						Corrosion allowance 2.0 mm					
			Undrained shear strength $c_{uk}$ [kPa]						Undrained shear strength $c_{uk}$ [kPa]						Undrained shear strength $c_{uk}$ [kPa]					
			5	7	10	15	20	50	5	7	10	15	20	50	5	7	10	15	20	50
RD115/6.3	S440	$L_{cr}/400$	421	507	544	579	599	645	388	439	468	494	510	545	404	494	568	605	626	671
		$L_{cr}/600$	489	534	571	605	624	665	429	462	490	515	530	561	467	553	593	649	649	689
RD115/8	S440	$L_{cr}/400$	464	568	673	726	758	830	435	532	605	648	673	733	446	546	676	735	767	837
		$L_{cr}/600$	541	652	709	762	792	858	506	588	635	678	703	757	520	632	714	768	799	863
RD140/8	S440	$L_{cr}/400$	653	799	872	931	966	1046	613	730	781	830	859	924	635	777	921	985	1022	1103
		$L_{cr}/600$	758	853	917	975	1008	1079	710	768	820	867	894	952	737	892	963	1027	1062	1134
RD140/10	S440	$L_{cr}/400$	710	870	1052	1138	1190	1308	675	827	969	1043	1088	1189	691	847	1049	1166	1219	1338
		$L_{cr}/600$	829	1007	1108	1195	1245	1353	787	940	1019	1094	1137	1229	806	980	1129	1220	1272	1380
RD170/10	S440	$L_{cr}/400$	975	1194	1341	1436	1493	1622	929	1138	1233	1316	1364	1475	958	1173	1422	1528	1589	1724
		$L_{cr}/600$	1134	1307	1410	1504	1558	1674	1079	1207	1296	1377	1422	1522	1114	1353	1489	1595	1653	1774
RD170/12.5	S440	$L_{cr}/400$	1057	1295	1603	1739	1821	2010	1016	1245	1504	1626	1700	1868	1037	1271	1575	1792	1878	2071
		$L_{cr}/600$	1234	1501	1687	1826	1907	2082	1185	1441	1583	1707	1778	1933	1211	1473	1730	1877	1961	2139
RD220/10	S440	$L_{cr}/400$	1519	1747	1864	1973	2037	2183	1451	1611	1712	1806	1861	1987	1513	1851	2107	2240	2315	2477
		$L_{cr}/600$	1706	1838	1955	2060	2119	2248	1579	1694	1794	1883	1934	2044	1750	2052	2199	2328	2397	2540
RD220/12.5	S440	$L_{cr}/400$	1654	2026	2259	2417	2511	2726	1594	1952	2118	2260	2343	2534	1643	2012	2441	2623	2728	2960
		$L_{cr}/600$	1922	2204	2374	2531	2620	2814	1850	2073	2225	2364	2443	2614	1910	2321	2556	2737	2838	3046
RD270/10	S440	$L_{cr}/400$	2152	2298	2429	2550	2621	2783	1988	2115	2229	2333	2393	2534	2211	2702	2929	3089	3178	3368
		$L_{cr}/600$	2265	2413	2541	2654	2718	2860	2092	2219	2329	2425	2480	2601	2548	2868	3048	3199	3279	3444
RD270/12.5	S440	$L_{cr}/400$	2391	2782	2971	3149	3253	3491	2308	2614	2783	2942	3034	3247	2402	2939	3382	3601	3726	3996
		$L_{cr}/600$	2713	2927	3117	3288	3384	3595	2556	2749	2918	3069	3154	3342	2782	3288	3532	3746	3862	4101
RD320/10	S440	$L_{cr}/400$	2665	2826	2969	3099	3176	3352	2459	2599	2721	2834	2899	3052	2966	3582	3795	3980	4082	4297
		$L_{cr}/600$	2802	2962	3098	3219	3287	3440	2584	2721	2837	2940	2998	3129	3406	3730	3938	4110	4200	4385
RD320/12.5	S440	$L_{cr}/400$	3177	3446	3654	3847	3959	4217	3028	3235	3421	3592	3692	3923	3222	3940	4361	4615	4757	5062
		$L_{cr}/600$	3386	3621	3826	4008	4110	4336	3187	3397	3578	3739	3830	4031	3720	4260	4544	4786	4916	5183

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