

PERMANENT CASE

Manhole chamber ref	SWMH1.2	SWMH1.3	SWMH1.4	SWMH1.5	SWMH1.6	SWMH1.7	SWMH1.8	SWMH1.9	SWMH1.10	SWMH1.11	SWMH1.12	SWMH1.13	SWMH1.14	SWMH1.15	SWCP1.16	SWMH1.17	SWMH1.18	SWMH1.19	SWMH1.20
Diameter (m)	1.350	1.350	1.350	1.350	1.350	1.350	1.500	1.500	1.800	1.800	1.800	1.800	1.800	1.800	1.800	1.800	1.800	2.100	1.800
Chamber wall thickness (m)	0.095	0.095	0.095	0.095	0.095	0.095	0.100	0.100	0.115	0.115	0.115	0.115	0.115	0.115	0.115	0.115	0.115	0.125	0.115
Concrete surround (m)	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150
Overall diameter (m)	1.840	1.840	1.840	1.840	1.840	1.840	2.000	2.000	2.330	2.330	2.330	2.330	2.330	2.330	2.330	2.330	2.330	2.650	2.330
CL (m AOD)	7.631	7.485	7.637	7.364	7.404	7.544	7.400	7.211	7.079	7.152	7.270	7.168	7.077	6.863	6.635	6.400	6.400	6.450	6.112
IL (m AOD)	6.320	6.260	6.175	6.050	5.860	5.810	5.610	5.570	5.240	5.200	5.175	5.120	5.100	5.070	4.520	4.975	4.930	4.860	4.635
Depth CL-IL (m)	1.311	1.225	1.462	1.314	1.544	1.734	1.790	1.641	1.839	1.952	2.095	2.048	1.977	1.793	2.115	1.425	1.470	1.590	1.477
Base thickness (m)	0.450	0.450	0.450	0.450	0.488	0.488	0.563	0.563	0.713	0.713	0.713	0.713	0.713	0.713	0.350	0.750	0.750	0.750	0.750
Overall depth (m)	1.761	1.675	1.912	1.764	2.032	2.222	2.353	2.204	2.552	2.665	2.808	2.761	2.690	2.506	2.465	2.175	2.220	2.340	2.227
Volume for buoyancy (m³)	4.680	4.452	5.082	4.688	5.399	5.905	7.387	6.921	10.874	11.357	11.967	11.767	11.464	10.680	10.505	9.269	9.461	12.900	9.491
Buoyancy uplift (kN)	46.8	44.5	50.8	46.9	54.0	59.1	73.9	69.2	108.7	113.6	119.7	117.7	114.6	106.8	105.1	92.7	94.6	129.0	94.9
Base solid volume (m³)	1.196	1.196	1.196	1.196	1.296	1.297	1.766	1.768	3.036	3.039	3.039	3.039	3.039	3.039	1.492	3.196	3.196	4.134	3.196
Cover construction depth (m)	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
Cover slab thickness (m)	0.170	0.170	0.170	0.170	0.170	0.170	0.175	0.175	0.175	0.175	0.175	0.175	0.175	0.175	0.175	0.175	0.175	0.200	0.175
Chamber ring depth (m)	0.891	0.805	1.042	0.894	1.124	1.314	1.365	1.216	1.414	1.527	1.670	1.623	1.552	1.368	1.690	1.000	1.045	1.140	1.052
Chamber ring outside dia. (m)	1.540	1.540	1.540	1.540	1.540	1.540	1.700	1.700	2.030	2.030	2.030	2.030	2.030	2.030	2.030	2.030	2.030	2.350	2.030
Chamber rings solid volume (m³)	0.384	0.347	0.449	0.385	0.484	0.566	0.686	0.611	0.978	1.056	1.155	1.122	1.073	0.946	1.169	0.692	0.723	0.996	0.727
Benching height (m)	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400
Benching volume (m³)	0.286	0.286	0.286	0.286	0.286	0.286	0.353	0.353	0.509	0.509	0.509	0.509	0.509	0.509	0.509	0.509	0.509	0.692	0.509
Cover slab diameter (m)	1.580	1.580	1.580	1.580	1.580	1.580	1.740	1.740	2.070	2.070	2.070	2.070	2.070	2.070	2.070	2.070	2.070	2.380	2.070
Cover slab gross volume (m³)	0.333	0.333	0.333	0.333	0.333	0.333	0.416	0.416	0.589	0.589	0.589	0.589	0.589	0.589	0.589	0.589	0.589	0.889	0.589
Cover slab access void (m³)	0.077	0.077	0.077	0.077	0.077	0.077	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.091	0.080
Cover slab net volume (m³)	0.256	0.256	0.256	0.256	0.256	0.256	0.336	0.336	0.509	0.509	0.509	0.509	0.509	0.509	0.509	0.509	0.509	0.798	0.509
Concrete surround height (m)	1.061	0.975	1.212	1.064	1.294	1.484	1.540	1.391	1.589	1.702	1.845	1.798	1.727	1.543	1.865	1.175	1.220	1.340	1.227
Concrete surround volume (m³)	0.845	0.776	0.965	0.847	1.030	1.181	1.342	1.212	1.632	1.748	1.894	1.846	1.773	1.584	1.915	1.206	1.253	1.578	1.260
Total concrete volume (m³)	2.966	2.861	3.152	2.970	3.352	3.586	4.483	4.280	6.663	6.860	7.105	7.025	6.903	6.586	5.593	6.112	6.189	8.198	6.201
Total concrete weight (kN)	68.2	65.8	72.5	68.3	77.1	82.5	103.1	98.4	153.3	157.8	163.4	161.6	158.8	151.5	128.6	140.6	142.4	188.6	142.6
Surfacing gross volume (m³)	0.664	0.664	0.664	0.664	0.664	0.664	0.785	0.785	1.065	1.065	1.065	1.065	1.065	1.065	1.065	1.065	1.065	1.378	1.065
Access hole (m³)	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114
Surfacing net volume (m³)	0.551	0.551	0.551	0.551	0.551	0.551	0.671	0.671	0.952	0.952	0.952	0.952	0.952	0.952	0.952	0.952	0.952	1.264	0.952
Total surfacing weight (kN)	11.0	11.0	11.0	11.0	11.0	11.0	13.4	13.4	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	25.3	19.0
Total chamber weight (kN)	79.2	76.8	83.5	79.3	88.1	93.5	116.5	111.9	172.3	176.8	182.5	180.6	177.8	170.5	147.7	159.6	161.4	213.9	161.7
Factor of safety	1.7	1.7	1.6	1.7	1.6	1.6	1.6	1.6	1.6	1.6	1.5	1.5	1.6	1.6	1.4	1.7	1.7	1.7	1.7
	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

TEMPORARY CASE [excluding cover and cover slab]

Depth for buoyancy (m)	1.341	1.255	1.492	1.344	1.612	1.802	1.928	1.779	2.127	2.240	2.383	2.336	2.265	2.081	2.040	1.750	1.795	1.890	1.802
Volume for buoyancy (m³)	3.564	3.335	3.965	3.572	4.283	4.789	6.052	5.586	9.062	9.546	10.156	9.955	9.653	8.869	8.694	7.458	7.650	10.419	7.680
Buoyancy uplift (kN)	35.6	33.4	39.7	35.7	42.8	47.9	60.5	55.9	90.6	95.5	101.6	99.6	96.5	88.7	86.9	74.6	76.5	104.2	76.8
Base solid volume (m³)	1.196	1.196	1.196	1.196	1.296	1.297	1.766	1.768	3.036	3.039	3.039	3.039	3.039	3.039	1.492	3.196	3.196	4.134	3.196
Chamber rings solid volume (m³)	0.384	0.347	0.449	0.385	0.484	0.566	0.686	0.611	0.978	1.056	1.155	1.122	1.073	0.946	1.169	0.692	0.723	0.996	0.727
Benching volume (m³)	0.286	0.286	0.286	0.286	0.286	0.286	0.353	0.353	0.509	0.509	0.509	0.509	0.509	0.509	0.509	0.509	0.509	0.692	0.509
Concrete surround height (m)	0.891	0.805	1.042	0.894	1.124	1.314	1.365	1.216	1.414	1.527	1.670	1.623	1.552	1.368	1.690	1.000	1.045	1.140	1.052
Concrete surround volume (m³)	0.709	0.641	0.829	0.712	0.895	1.046	1.189	1.060	1.452	1.568	1.715	1.666	1.594	1.405	1.735	1.027	1.073	1.342	1.080
Total concrete volume (m³)	2.575	2.470	2.761	2.579	2.961	3.195	3.995	3.792	5.975	6.171	6.417	6.336	6.214	5.898	4.904	5.423	5.501	7.165	5.513
Total concrete weight (kN)	59.2	56.8	63.5	59.3	68.1	73.5	91.9	87.2	137.4	141.9	147.6	145.7	142.9	135.7	112.8	124.7	126.5	164.8	126.8
Factor of safety	1.7	1.7	1.6	1.7	1.6	1.5	1.5	1.6	1.5	1.5	1.5	1.5	1.5	1.5	1.3	1.7	1.7	1.6	1.7
	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

PERMANENT CASE

Manhole chamber ref	SWMH1.21	SWMH1.22	SWMH1.23	SWMH1.24	SWMH1.25	SWMH2.1	SWMH3.1	SWMH3.2	SWMH3.3	SWMH3.4	SWMH3.5	SWMH3.6	SWMH4.1	SWMH5.1	SWMH5.2	SWMH5.3	SWMH6.1	SWMH6.2	SWMH6.3
Diameter (m)	1.800	1.800	1.800	2.400	1.500	1.350	1.350	1.350	1.350	1.500	1.500	1.500	1.350	1.500	1.500	1.500	1.350	1.350	1.350
Chamber wall thickness (m)	0.115	0.115	0.115	0.140	0.100	0.095	0.095	0.095	0.095	0.100	0.100	0.100	0.095	0.100	0.100	0.100	0.095	0.095	0.095
Concrete surround (m)	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150
Overall diameter (m)	2.330	2.330	2.330	2.980	2.000	1.840	1.840	1.840	1.840	2.000	2.000	2.000	1.840	2.000	2.000	2.000	1.840	1.840	1.840
CL (m AOD)	6.953	6.572	6.778	6.850	6.700	7.675	7.608	7.621	7.577	7.403	7.246	7.109	7.086	7.167	6.987	7.256	7.318	7.335	7.299
IL (m AOD)	4.590	4.535	4.510	4.460	4.200	6.370	6.375	6.350	6.210	5.975	5.900	5.740	5.810	5.470	5.420	5.375	5.820	5.700	5.550
Depth CL-IL (m)	2.363	2.037	2.268	2.390	2.500	1.305	1.233	1.271	1.367	1.428	1.346	1.369	1.276	1.697	1.567	1.881	1.498	1.635	1.749
Base thickness (m)	0.750	0.750	0.750	0.750	0.600	0.450	0.450	0.450	0.450	0.488	0.488	0.488	0.450	0.600	0.600	0.600	0.450	0.488	0.525
Overall depth (m)	3.113	2.787	3.018	3.140	3.100	1.755	1.683	1.721	1.817	1.916	1.834	1.857	1.726	2.297	2.167	2.481	1.948	2.123	2.274
Volume for buoyancy (m³)	13.267	11.877	12.862	21.889	9.734	4.664	4.473	4.574	4.829	6.015	5.759	5.831	4.587	7.213	6.804	7.790	5.177	5.641	6.044
Buoyancy uplift (kN)	132.7	118.8	128.6	218.9	97.3	46.6	44.7	45.7	48.3	60.1	57.6	58.3	45.9	72.1	68.0	77.9	51.8	56.4	60.4
Base solid volume (m³)	3.196	3.196	3.196	5.228	1.884	1.196	1.196	1.196	1.196	1.531	1.532	1.532	1.196	1.884	1.884	1.884	1.196	1.296	1.395
Cover construction depth (m)	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
Cover slab thickness (m)	0.175	0.175	0.175	0.200	0.175	0.170	0.170	0.170	0.170	0.175	0.175	0.175	0.170	0.175	0.175	0.175	0.170	0.170	0.170
Chamber ring depth (m)	1.938	1.612	1.843	1.940	2.075	0.885	0.813	0.851	0.947	1.003	0.921	0.944	0.856	1.272	1.142	1.456	1.078	1.215	1.329
Chamber ring outside dia. (m)	2.030	2.030	2.030	2.680	1.700	1.540	1.540	1.540	1.540	1.700	1.700	1.700	1.540	1.700	1.700	1.700	1.540	1.540	1.540
Chamber rings solid volume (m³)	1.340	1.115	1.274	2.166	1.042	0.381	0.350	0.367	0.408	0.504	0.463	0.474	0.369	0.639	0.574	0.731	0.465	0.524	0.573
Benching height (m)	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400
Benching volume (m³)	0.509	0.509	0.509	0.904	0.353	0.286	0.286	0.286	0.286	0.353	0.353	0.353	0.286	0.353	0.353	0.353	0.286	0.286	0.286
Cover slab diameter (m)	2.070	2.070	2.070	2.710	1.740	1.580	1.580	1.580	1.580	1.740	1.740	1.740	1.580	1.740	1.740	1.740	1.580	1.580	1.580
Cover slab gross volume (m³)	0.589	0.589	0.589	1.153	0.416	0.333	0.333	0.333	0.333	0.416	0.416	0.416	0.333	0.416	0.416	0.416	0.333	0.333	0.333
Cover slab access void (m³)	0.080	0.080	0.080	0.091	0.080	0.077	0.077	0.077	0.077	0.080	0.080	0.080	0.077	0.080	0.080	0.080	0.077	0.077	0.077
Cover slab net volume (m³)	0.509	0.509	0.509	1.062	0.336	0.256	0.256	0.256	0.256	0.336	0.336	0.336	0.256	0.336	0.336	0.336	0.256	0.256	0.256
Concrete surround height (m)	2.113	1.787	2.018	2.140	2.250	1.055	0.983	1.021	1.117	1.178	1.096	1.119	1.026	1.447	1.317	1.631	1.248	1.385	1.499
Concrete surround volume (m³)	2.170	1.835	2.072	2.852	1.961	0.840	0.782	0.813	0.889	1.026	0.955	0.975	0.817	1.261	1.148	1.421	0.993	1.102	1.193
Total concrete volume (m³)	7.724	7.163	7.560	12.213	5.576	2.959	2.871	2.917	3.035	3.751	3.639	3.671	2.923	4.473	4.295	4.726	3.196	3.464	3.703
Total concrete weight (kN)	177.6	164.8	173.9	280.9	128.3	68.1	66.0	67.1	69.8	86.3	83.7	84.4	67.2	102.9	98.8	108.7	73.5	79.7	85.2
Surfacing gross volume (m³)	1.065	1.065	1.065	1.743	0.785	0.664	0.664	0.664	0.664	0.785	0.785	0.785	0.664	0.785	0.785	0.785	0.664	0.664	0.664
Access hole (m³)	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114
Surfacing net volume (m³)	0.952	0.952	0.952	1.629	0.671	0.551	0.551	0.551	0.551	0.671	0.671	0.671	0.551	0.671	0.671	0.671	0.551	0.551	0.551
Total surfacing weight (kN)	19.0	19.0	19.0	32.6	13.4	11.0	11.0	11.0	11.0	13.4	13.4	13.4	11.0	13.4	13.4	13.4	11.0	11.0	11.0
Total chamber weight (kN)	196.7	183.8	192.9	313.5	141.7	79.1	77.0	78.1	80.8	99.7	97.1	97.9	78.2	116.3	112.2	122.1	84.5	90.7	96.2
Factor of safety	1.5	1.5	1.5	1.4	1.5	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.6	1.6	1.6	1.6	1.6	1.6
	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

TEMPORARY CASE [excluding cover and cover slab]

Depth for buoyancy (m)	2.688	2.362	2.593	2.690	2.675	1.335	1.263	1.301	1.397	1.491	1.409	1.432	1.306	1.872	1.742	2.056	1.528	1.703	1.854
Volume for buoyancy (m³)	11.455	10.066	11.051	18.752	8.400	3.548	3.357	3.458	3.713	4.680	4.424	4.496	3.471	5.878	5.470	6.456	4.061	4.525	4.927
Buoyancy uplift (kN)	114.6	100.7	110.5	187.5	84.0	35.5	33.6	34.6	37.1	46.8	44.2	45.0	34.7	58.8	54.7	64.6	40.6	45.2	49.3
Base solid volume (m³)	3.196	3.196	3.196	5.228	1.884	1.196	1.196	1.196	1.196	1.531	1.532	1.532	1.196	1.884	1.884	1.884	1.196	1.296	1.395
Chamber rings solid volume (m³)	1.340	1.115	1.274	2.166	1.042	0.381	0.350	0.367	0.408	0.504	0.463	0.474	0.369	0.639	0.574	0.731	0.465	0.524	0.573
Benching volume (m³)	0.509	0.509	0.509	0.904	0.353	0.286	0.286	0.286	0.286	0.353	0.353	0.353	0.286	0.353	0.353	0.353	0.286	0.286	0.286
Concrete surround height (m)	1.938	1.612	1.843	1.940	2.075	0.885	0.813	0.851	0.947	1.003	0.921	0.944	0.856	1.272	1.142	1.456	1.078	1.215	1.329
Concrete surround volume (m³)	1.990	1.655	1.892	2.586	1.808	0.704	0.647	0.677	0.754	0.874	0.803	0.823	0.681	1.108	0.995	1.269	0.858	0.967	1.058
Total concrete volume (m³)	7.035	6.475	6.872	10.885	5.088	2.568	2.480	2.526	2.644	3.262	3.151	3.182	2.532	3.985	3.806	4.237	2.805	3.073	3.312
Total concrete weight (kN)	161.8	148.9	158.1	250.3	117.0	59.1	57.0	58.1	60.8	75.0	72.5	73.2	58.2	91.6	87.5	97.5	64.5	70.7	76.2
Factor of safety	1.4	1.5	1.4	1.3	1.4	1.7	1.7	1.7	1.6	1.6	1.6	1.6	1.7	1.6	1.6	1.5	1.6	1.6	1.5
	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

PERMANENT CASE

Manhole chamber ref	SWMH6.4	SWMH7.1	SWMH7.2	SWMH7.3	SWMH7.4	SWMH7.5	SWCP7.6	SWMH8.1	SWMH8.2	SWMH8.3	SWMH8.4	SWMH8.5	SWMH8.6	SWMH8.7	SWMH8.8	SWMH8.9	SWMH8.10	SWMH8.11	SWMH8.12
Diameter (m)	1.500	1.500	1.500	1.500	1.500	1.500	1.800	1.350	1.350	1.350	1.350	1.350	1.800	1.800	1.800	1.800	1.800	1.800	1.800
Chamber wall thickness (m)	0.100	0.100	0.100	0.100	0.100	0.100	0.115	0.095	0.095	0.095	0.095	0.095	0.115	0.115	0.115	0.115	0.115	0.115	0.115
Concrete surround (m)	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150
Overall diameter (m)	2.000	2.000	2.000	2.000	2.000	2.000	2.330	1.840	1.840	1.840	1.840	1.840	2.330	2.330	2.330	2.330	2.330	2.330	2.330
CL (m AOD)	7.236	7.223	7.310	7.230	7.117	6.900	6.500	7.343	7.235	7.030	7.031	7.089	7.641	7.512	7.412	7.251	7.025	6.648	6.679
IL (m AOD)	5.375	5.610	5.575	5.520	5.420	5.375	4.580	5.560	5.535	5.480	5.445	5.420	4.980	4.945	4.930	4.910	4.890	4.830	4.810
Depth CL-IL (m)	1.861	1.613	1.735	1.710	1.697	1.525	1.920	1.783	1.700	1.550	1.586	1.669	2.661	2.567	2.482	2.341	2.135	1.818	1.869
Base thickness (m)	0.600	0.600	0.600	0.600	0.600	0.600	0.350	0.525	0.525	0.525	0.525	0.525	0.675	0.675	0.675	0.675	0.675	0.675	0.675
Overall depth (m)	2.461	2.213	2.335	2.310	2.297	2.125	2.270	2.308	2.225	2.075	2.111	2.194	3.336	3.242	3.157	3.016	2.810	2.493	2.544
Volume for buoyancy (m³)	7.728	6.949	7.332	7.253	7.213	6.673	9.674	6.134	5.913	5.515	5.610	5.831	14.217	13.816	13.454	12.853	11.975	10.624	10.842
Buoyancy uplift (kN)	77.3	69.5	73.3	72.5	72.1	66.7	96.7	61.3	59.1	55.1	56.1	58.3	142.2	138.2	134.5	128.5	119.8	106.2	108.4
Base solid volume (m³)	1.884	1.884	1.884	1.884	1.884	1.884	1.492	1.395	1.395	1.395	1.395	1.395	2.877	2.877	2.877	2.877	2.877	2.877	2.877
Cover construction depth (m)	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
Cover slab thickness (m)	0.175	0.175	0.175	0.175	0.175	0.175	0.175	0.170	0.170	0.170	0.170	0.170	0.175	0.175	0.175	0.175	0.175	0.175	0.175
Chamber ring depth (m)	1.436	1.188	1.310	1.285	1.272	1.100	1.495	1.363	1.280	1.130	1.166	1.249	2.236	2.142	2.057	1.916	1.710	1.393	1.444
Chamber ring outside dia. (m)	1.700	1.700	1.700	1.700	1.700	1.700	2.030	1.540	1.540	1.540	1.540	1.540	2.030	2.030	2.030	2.030	2.030	2.030	2.030
Chamber rings solid volume (m³)	0.721	0.597	0.658	0.646	0.639	0.553	1.034	0.588	0.552	0.487	0.503	0.538	1.546	1.481	1.422	1.325	1.182	0.963	0.999
Benching height (m)	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400
Benching volume (m³)	0.353	0.353	0.353	0.353	0.353	0.353	0.509	0.286	0.286	0.286	0.286	0.286	0.509	0.509	0.509	0.509	0.509	0.509	0.509
Cover slab diameter (m)	1.740	1.740	1.740	1.740	1.740	1.740	2.070	1.580	1.580	1.580	1.580	1.580	2.070	2.070	2.070	2.070	2.070	2.070	2.070
Cover slab gross volume (m³)	0.416	0.416	0.416	0.416	0.416	0.416	0.589	0.333	0.333	0.333	0.333	0.333	0.589	0.589	0.589	0.589	0.589	0.589	0.589
Cover slab access void (m³)	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.077	0.077	0.077	0.077	0.077	0.080	0.080	0.080	0.080	0.080	0.080	0.080
Cover slab net volume (m³)	0.336	0.336	0.336	0.336	0.336	0.336	0.509	0.256	0.256	0.256	0.256	0.256	0.509	0.509	0.509	0.509	0.509	0.509	0.509
Concrete surround height (m)	1.611	1.363	1.485	1.460	1.447	1.275	1.670	1.533	1.450	1.300	1.336	1.419	2.411	2.317	2.232	2.091	1.885	1.568	1.619
Concrete surround volume (m³)	1.404	1.188	1.294	1.272	1.261	1.111	1.715	1.220	1.154	1.035	1.063	1.130	2.476	2.379	2.292	2.147	1.935	1.610	1.662
Total concrete volume (m³)	4.699	4.358	4.526	4.491	4.473	4.237	5.258	3.745	3.643	3.459	3.503	3.605	7.916	7.754	7.608	7.366	7.012	6.467	6.555
Total concrete weight (kN)	108.1	100.2	104.1	103.3	102.9	97.5	120.9	86.1	83.8	79.6	80.6	82.9	182.1	178.4	175.0	169.4	161.3	148.8	150.8
Surfacing gross volume (m³)	0.785	0.785	0.785	0.785	0.785	0.785	1.065	0.664	0.664	0.664	0.664	0.664	1.065	1.065	1.065	1.065	1.065	1.065	1.065
Access hole (m³)	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114
Surfacing net volume (m³)	0.671	0.671	0.671	0.671	0.671	0.671	0.952	0.551	0.551	0.551	0.551	0.551	0.952	0.952	0.952	0.952	0.952	0.952	0.952
Total surfacing weight (kN)	13.4	13.4	13.4	13.4	13.4	13.4	19.0	11.0	11.0	11.0	11.0	11.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0
Total chamber weight (kN)	121.5	113.7	117.5	116.7	116.3	110.9	140.0	97.1	94.8	90.6	91.6	93.9	201.1	197.4	194.0	188.5	180.3	167.8	169.8
Factor of safety	1.6	1.6	1.6	1.6	1.6	1.7	1.4	1.6	1.6	1.6	1.6	1.6	1.4	1.4	1.4	1.5	1.5	1.6	1.6
	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

TEMPORARY CASE [excluding cover and cover slab]

Depth for buoyancy (m)	2.036	1.788	1.910	1.885	1.872	1.700	1.845	1.888	1.805	1.655	1.691	1.774	2.911	2.817	2.732	2.591	2.385	2.068	2.119
Volume for buoyancy (m³)	6.393	5.614	5.997	5.919	5.878	5.338	7.863	5.018	4.797	4.398	4.494	4.715	12.406	12.005	11.643	11.042	10.164	8.813	9.031
Buoyancy uplift (kN)	63.9	56.1	60.0	59.2	58.8	53.4	78.6	50.2	48.0	44.0	44.9	47.1	124.1	120.1	116.4	110.4	101.6	88.1	90.3
Base solid volume (m³)	1.884	1.884	1.884	1.884	1.884	1.884	1.492	1.395	1.395	1.395	1.395	1.395	2.877	2.877	2.877	2.877	2.877	2.877	2.877
Chamber rings solid volume (m³)	0.721	0.597	0.658	0.646	0.639	0.553	1.034	0.588	0.552	0.487	0.503	0.538	1.546	1.481	1.422	1.325	1.182	0.963	0.999
Benching volume (m³)	0.353	0.353	0.353	0.353	0.353	0.353	0.509	0.286	0.286	0.286	0.286	0.286	0.509	0.509	0.509	0.509	0.509	0.509	0.509
Concrete surround height (m)	1.436	1.188	1.310	1.285	1.272	1.100	1.495	1.363	1.280	1.130	1.166	1.249	2.236	2.142	2.057	1.916	1.710	1.393	1.444
Concrete surround volume (m³)	1.251	1.035	1.141	1.120	1.108	0.958	1.535	1.085	1.019	0.899	0.928	0.994	2.296	2.199	2.112	1.967	1.756	1.430	1.483
Total concrete volume (m³)	4.210	3.869	4.037	4.003	3.985	3.748	4.569	3.354	3.252	3.068	3.112	3.214	7.227	7.066	6.920	6.678	6.324	5.779	5.867
Total concrete weight (kN)	96.8	89.0	92.8	92.1	91.6	86.2	105.1	77.1	74.8	70.6	71.6	73.9	166.2	162.5	159.2	153.6	145.4	132.9	134.9
Factor of safety	1.5	1.6	1.5	1.6	1.6	1.6	1.3	1.5	1.6	1.6	1.6	1.6	1.3	1.4	1.4	1.4	1.4	1.5	1.5
	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

PERMANENT CASE																			
Manhole chamber ref	SWMH8.13	SWMH8.14	SWCP8.15	SWMH9.1	SWMH10.1	SWMH10.2	SWMH10.3	SWMH11.1	SWMH11.2	SWMH12.1	SWMH12.2	SWMH12.3	SWMH13.1	SWMH14.1	SWMH14.2	SWMH14.3	SWMH15.1	SWMH15.2	HWMH16.1
Diameter (m)	1.800	1.800	1.800	1.200	1.350	1.500	1.500	1.500	1.500	1.350	1.350	1.500	1.350	1.500	1.500	1.800	1.350	1.350	1.350
Chamber wall thickness (m)	0.115	0.115	0.115	0.090	0.095	0.100	0.100	0.100	0.100	0.095	0.095	0.100	0.095	0.100	0.100	0.115	0.095	0.095	0.095
Concrete surround (m)	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150
Overall diameter (m)	2.330	2.330	2.330	1.680	1.840	2.000	2.000	2.000	2.000	1.840	1.840	2.000	1.840	2.000	2.000	2.330	1.840	1.840	1.840
CL (m AOD)	6.730	6.407	6.424	7.319	6.774	6.797	6.818	7.098	6.848	7.089	7.142	6.925	6.533	7.276	7.076	6.831	6.568	6.695	6.683
IL (m AOD)	4.780	4.735	4.725	5.500	5.540	5.190	5.140	5.120	5.070	5.450	5.420	4.960	5.260	4.960	4.910	4.860	5.280	5.220	5.430
Depth CL-IL (m)	1.950	1.672	1.699	1.819	1.234	1.607	1.678	1.978	1.778	1.639	1.722	1.965	1.273	2.316	2.166	1.971	1.288	1.475	1.253
Base thickness (m)	0.675	0.675	0.350	0.450	0.450	0.600	0.600	0.600	0.600	0.450	0.450	0.638	0.450	0.600	0.600	0.600	0.450	0.450	0.413
Overall depth (m)	2.625	2.347	2.049	2.269	1.684	2.207	2.278	2.578	2.378	2.089	2.172	2.603	1.723	2.916	2.766	2.571	1.738	1.925	1.666
Volume for buoyancy (m³)	11.187	10.002	8.732	5.027	4.476	6.930	7.153	8.095	7.467	5.552	5.773	8.172	4.579	9.156	8.685	10.957	4.619	5.116	4.426
Buoyancy uplift (kN)	111.9	100.0	87.3	50.3	44.8	69.3	71.5	80.9	74.7	55.5	57.7	81.7	45.8	91.6	86.9	109.6	46.2	51.2	44.3
Base solid volume (m³)	2.877	2.877	1.492	0.997	1.196	1.884	1.884	1.884	1.884	1.196	1.196	2.002	1.196	1.884	1.884	2.557	1.196	1.196	1.096
Cover construction depth (m)	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
Cover slab thickness (m)	0.175	0.175	0.175	0.150	0.170	0.175	0.175	0.175	0.175	0.170	0.170	0.175	0.170	0.175	0.175	0.175	0.170	0.170	0.170
Chamber ring depth (m)	1.525	1.247	1.274	1.419	0.814	1.182	1.253	1.553	1.353	1.219	1.302	1.540	0.853	1.891	1.741	1.546	0.868	1.055	0.833
Chamber ring outside dia. (m)	2.030	2.030	2.030	1.380	1.540	1.700	1.700	1.700	1.700	1.540	1.540	1.700	1.540	1.700	1.700	2.030	1.540	1.540	1.540
Chamber rings solid volume (m³)	1.055	0.862	0.881	0.517	0.351	0.594	0.630	0.780	0.680	0.525	0.561	0.774	0.368	0.950	0.875	1.069	0.374	0.455	0.359
Benching height (m)	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400
Benching volume (m³)	0.509	0.509	0.509	0.226	0.286	0.353	0.353	0.353	0.353	0.286	0.286	0.353	0.286	0.353	0.353	0.509	0.286	0.286	0.286
Cover slab diameter (m)	2.070	2.070	2.070	1.450	1.580	1.740	1.740	1.740	1.740	1.580	1.580	1.740	1.580	1.740	1.740	2.070	1.580	1.580	1.580
Cover slab gross volume (m³)	0.589	0.589	0.589	0.248	0.333	0.416	0.416	0.416	0.416	0.333	0.333	0.416	0.333	0.416	0.416	0.589	0.333	0.333	0.333
Cover slab access void (m³)	0.080	0.080	0.080	0.068	0.077	0.080	0.080	0.080	0.080	0.077	0.077	0.080	0.077	0.080	0.080	0.080	0.077	0.077	0.077
Cover slab net volume (m³)	0.509	0.509	0.509	0.179	0.256	0.336	0.336	0.336	0.336	0.256	0.256	0.336	0.256	0.336	0.336	0.509	0.256	0.256	0.256
Concrete surround height (m)	1.700	1.422	1.449	1.569	0.984	1.357	1.428	1.728	1.528	1.389	1.472	1.715	1.023	2.066	1.916	1.721	1.038	1.225	1.003
Concrete surround volume (m³)	1.746	1.460	1.488	1.131	0.783	1.182	1.244	1.506	1.331	1.106	1.172	1.494	0.814	1.800	1.670	1.767	0.826	0.975	0.798
Total concrete volume (m³)	6.694	6.217	4.878	3.050	2.872	4.350	4.447	4.859	4.585	3.369	3.471	4.959	2.920	5.324	5.118	6.411	2.938	3.168	2.796
Total concrete weight (kN)	154.0	143.0	112.2	70.2	66.1	100.0	102.3	111.8	105.4	77.5	79.8	114.1	67.2	122.4	117.7	147.4	67.6	72.9	64.3
Surfacing gross volume (m³)	1.065	1.065	1.065	0.554	0.664	0.785	0.785	0.785	0.785	0.664	0.664	0.785	0.664	0.785	0.785	1.065	0.664	0.664	0.664
Access hole (m³)	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114
Surfacing net volume (m³)	0.952	0.952	0.952	0.440	0.551	0.671	0.671	0.671	0.671	0.551	0.551	0.671	0.551	0.671	0.671	0.952	0.551	0.551	0.551
Total surfacing weight (kN)	19.0	19.0	19.0	8.8	11.0	13.4	13.4	13.4	13.4	11.0	11.0	13.4	11.0	13.4	13.4	19.0	11.0	11.0	11.0
Total chamber weight (kN)	173.0	162.0	131.2	79.0	77.1	113.5	115.7	125.2	118.9	88.5	90.8	127.5	78.2	135.9	131.1	166.5	78.6	83.9	75.3
Factor of safety	1.5	1.6	1.5	1.6	1.7	1.6	1.6	1.5	1.6	1.6	1.6	1.6	1.7	1.5	1.5	1.5	1.7	1.6	1.7
	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

TEMPORARY CASE [excluding cover and cover slab]																			
Depth for buoyancy (m)	2.200	1.922	1.624	1.869	1.264	1.782	1.853	2.153	1.953	1.669	1.752	2.178	1.303	2.491	2.341	2.146	1.318	1.505	1.246
Volume for buoyancy (m³)	9.376	8.191	6.921	4.141	3.359	5.595	5.818	6.760	6.132	4.436	4.656	6.837	3.463	7.822	7.351	9.146	3.503	4.000	3.310
Buoyancy uplift (kN)	93.8	81.9	69.2	41.4	33.6	56.0	58.2	67.6	61.3	44.4	46.6	68.4	34.6	78.2	73.5	91.5	35.0	40.0	33.1
Base solid volume (m³)	2.877	2.877	1.492	0.997	1.196	1.884	1.884	1.884	1.884	1.196	1.196	2.002	1.196	1.884	1.884	2.557	1.196	1.196	1.096
Chamber rings solid volume (m³)	1.055	0.862	0.881	0.517	0.351	0.594	0.630	0.780	0.680	0.525	0.561	0.774	0.368	0.950	0.875	1.069	0.374	0.455	0.359
Benching volume (m³)	0.509	0.509	0.509	0.226	0.286	0.353	0.353	0.353	0.353	0.286	0.286	0.353	0.286	0.353	0.353	0.509	0.286	0.286	0.286
Concrete surround height (m)	1.525	1.247	1.274	1.419	0.814	1.182	1.253	1.553	1.353	1.219	1.302	1.540	0.853	1.891	1.741	1.546	0.868	1.055	0.833
Concrete surround volume (m³)	1.566	1.280	1.308	1.023	0.648	1.030	1.092	1.353	1.179	0.970	1.036	1.342	0.679	1.648	1.517	1.587	0.691	0.840	0.663
Total concrete volume (m³)	6.006	5.528	4.189	2.763	2.481	3.861	3.959	4.371	4.096	2.978	3.080	4.471	2.529	4.835	4.629	5.722	2.547	2.777	2.405
Total concrete weight (kN)	138.1	127.1	96.4	63.5	57.1	88.8	91.0	100.5	94.2	68.5	70.8	102.8	58.2	111.2	106.5	131.6	58.6	63.9	55.3
Factor of safety	1.5	1.6	1.4	1.5	1.7	1.6	1.6	1.5	1.5	1.5	1.5	1.5	1.7	1.4	1.4	1.4	1.7	1.6	1.7
	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

PERMANENT CASE

Manhole chamber ref	SWMH16.2	SWMH16.3	SWCP16.4	SWMH17.1	SWMH17.2	SWMH17.3	SWMH17.4	SWMH17.5	SWCP17.6	SWMH17.7	SWCP17.8	SWMH17.9	SWMH17.10	SWMH18.1	SWCP19.1	SWCP19.2	HWMH20.1	HWMH20.2	SWMH21.1
Diameter (m)	1.350	1.200	1.800	1.500	1.500	1.500	1.500	1.800	1.800	1.800	1.800	2.100	1.500	1.500	1.800	1.800	1.350	1.350	1.350
Chamber wall thickness (m)	0.095	0.090	0.115	0.100	0.100	0.100	0.100	0.115	0.115	0.115	0.115	0.125	0.100	0.100	0.115	0.115	0.095	0.095	0.095
Concrete surround (m)	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150
Overall diameter (m)	1.840	1.680	2.330	2.000	2.000	2.000	2.000	2.330	2.330	2.330	2.330	2.650	2.000	2.000	2.330	2.330	1.840	1.840	1.840
CL (m AOD)	6.703	6.956	7.000	6.852	6.275	6.098	5.978	6.310	6.534	6.444	5.428	5.800	5.750	6.206	5.539	5.892	6.428	6.314	6.546
IL (m AOD)	5.310	5.160	5.110	4.550	4.440	4.400	4.350	4.290	3.775	4.230	3.700	4.170	3.985	4.310	3.825	3.780	4.710	4.630	4.850
Depth CL-IL (m)	1.393	1.796	1.890	2.302	1.835	1.698	1.628	2.020	2.759	2.214	1.728	1.630	1.765	1.896	1.714	2.112	1.718	1.684	1.696
Base thickness (m)	0.413	0.413	0.413	0.600	0.600	0.600	0.600	0.600	0.350	0.600	0.350	0.600	0.600	0.600	0.350	0.350	0.413	0.413	0.450
Overall depth (m)	1.806	2.209	2.303	2.902	2.435	2.298	2.228	2.620	3.109	2.814	2.078	2.230	2.365	2.496	2.064	2.462	2.131	2.097	2.146
Volume for buoyancy (m³)	4.800	4.894	9.815	9.112	7.646	7.216	6.996	11.166	13.250	11.992	8.856	12.293	7.426	7.837	8.796	10.492	5.662	5.573	5.703
Buoyancy uplift (kN)	48.0	48.9	98.1	91.1	76.5	72.2	70.0	111.7	132.5	119.9	88.6	122.9	74.3	78.4	88.0	104.9	56.6	55.7	57.0
Base solid volume (m³)	1.098	0.915	1.760	1.884	1.884	1.884	1.884	2.557	1.492	2.557	1.492	3.308	1.884	1.884	1.492	1.492	1.096	1.098	1.196
Cover construction depth (m)	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
Cover slab thickness (m)	0.170	0.150	0.175	0.175	0.175	0.175	0.175	0.175	0.175	0.175	0.175	0.200	0.175	0.175	0.175	0.175	0.170	0.170	0.170
Chamber ring depth (m)	0.973	1.396	1.465	1.877	1.410	1.273	1.203	1.595	2.334	1.789	1.303	1.180	1.340	1.471	1.289	1.687	1.298	1.264	1.276
Chamber ring outside dia. (m)	1.540	1.380	2.030	1.700	1.700	1.700	1.700	2.030	2.030	2.030	2.030	2.350	1.700	1.700	2.030	2.030	1.540	1.540	1.540
Chamber rings solid volume (m³)	0.419	0.509	1.013	0.943	0.708	0.640	0.604	1.103	1.614	1.237	0.901	1.031	0.673	0.739	0.891	1.167	0.559	0.545	0.550
Benching height (m)	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400
Benching volume (m³)	0.286	0.226	0.509	0.353	0.353	0.353	0.353	0.509	0.509	0.509	0.509	0.692	0.353	0.353	0.509	0.509	0.286	0.286	0.286
Cover slab diameter (m)	1.580	1.450	2.070	1.740	1.740	1.740	1.740	2.070	2.070	2.070	2.070	2.380	1.740	1.740	2.070	2.070	1.580	1.580	1.580
Cover slab gross volume (m³)	0.333	0.248	0.589	0.416	0.416	0.416	0.416	0.589	0.589	0.589	0.589	0.889	0.416	0.416	0.589	0.589	0.333	0.333	0.333
Cover slab access void (m³)	0.077	0.068	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.091	0.080	0.080	0.080	0.080	0.077	0.077	0.077
Cover slab net volume (m³)	0.256	0.179	0.509	0.336	0.336	0.336	0.336	0.509	0.509	0.509	0.509	0.798	0.336	0.336	0.509	0.509	0.256	0.256	0.256
Concrete surround height (m)	1.143	1.546	1.640	2.052	1.585	1.448	1.378	1.770	2.509	1.964	1.478	1.380	1.515	1.646	1.464	1.862	1.468	1.434	1.446
Concrete surround volume (m³)	0.910	1.114	1.684	1.788	1.381	1.262	1.201	1.817	2.576	2.017	1.518	1.625	1.320	1.434	1.503	1.912	1.169	1.141	1.151
Total concrete volume (m³)	2.969	2.943	5.475	5.304	4.663	4.475	4.379	6.495	6.699	6.828	4.928	7.454	4.567	4.747	4.904	5.588	3.366	3.326	3.439
Total concrete weight (kN)	68.3	67.7	125.9	122.0	107.2	102.9	100.7	149.4	154.1	157.1	113.3	171.4	105.0	109.2	112.8	128.5	77.4	76.5	79.1
Surfacing gross volume (m³)	0.664	0.554	1.065	0.785	0.785	0.785	0.785	1.065	1.065	1.065	1.065	1.378	0.785	0.785	1.065	1.065	0.664	0.664	0.664
Access hole (m³)	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114
Surfacing net volume (m³)	0.551	0.440	0.952	0.671	0.671	0.671	0.671	0.952	0.952	0.952	0.952	1.264	0.671	0.671	0.952	0.952	0.551	0.551	0.551
Total surfacing weight (kN)	11.0	8.8	19.0	13.4	13.4	13.4	13.4	19.0	19.0	19.0	19.0	25.3	13.4	13.4	19.0	19.0	11.0	11.0	11.0
Total chamber weight (kN)	79.3	76.5	144.9	135.4	120.7	116.3	114.1	168.4	173.1	176.1	132.4	196.7	118.5	122.6	131.8	147.5	88.4	87.5	90.1
Factor of safety	1.7	1.6	1.5	1.5	1.6	1.6	1.6	1.5	1.3	1.5	1.5	1.6	1.6	1.6	1.5	1.4	1.6	1.6	1.6
	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

TEMPORARY CASE [excluding cover and cover slab]

Depth for buoyancy (m)	1.386	1.809	1.878	2.477	2.010	1.873	1.803	2.195	2.684	2.389	1.653	1.780	1.940	2.071	1.639	2.037	1.711	1.677	1.726
Volume for buoyancy (m³)	3.684	4.008	8.003	7.778	6.311	5.881	5.661	9.354	11.438	10.181	7.045	9.813	6.092	6.503	6.985	8.681	4.546	4.457	4.587
Buoyancy uplift (kN)	36.8	40.1	80.0	77.8	63.1	58.8	56.6	93.5	114.4	101.8	70.4	98.1	60.9	65.0	69.8	86.8	45.5	44.6	45.9
Base solid volume (m³)	1.098	0.915	1.760	1.884	1.884	1.884	1.884	2.557	1.492	2.557	1.492	3.308	1.884	1.884	1.492	1.492	1.096	1.098	1.196
Chamber rings solid volume (m³)	0.419	0.509	1.013	0.943	0.708	0.640	0.604	1.103	1.614	1.237	0.901	1.031	0.673	0.739	0.891	1.167	0.559	0.545	0.550
Benching volume (m³)	0.286	0.226	0.509	0.353	0.353	0.353	0.353	0.509	0.509	0.509	0.509	0.692	0.353	0.353	0.509	0.509	0.286	0.286	0.286
Concrete surround height (m)	0.973	1.396	1.465	1.877	1.410	1.273	1.203	1.595	2.334	1.789	1.303	1.180	1.340	1.471	1.289	1.687	1.298	1.264	1.276
Concrete surround volume (m³)	0.774	1.006	1.504	1.636	1.229	1.109	1.048	1.638	2.397	1.837	1.338	1.389	1.168	1.282	1.324	1.732	1.033	1.006	1.016
Total concrete volume (m³)	2.578	2.656	4.786	4.816	4.174	3.986	3.890	5.806	6.011	6.140	4.239	6.420	4.078	4.258	4.215	4.899	2.975	2.935	3.048
Total concrete weight (kN)	59.3	61.1	110.1	110.8	96.0	91.7	89.5	133.5	138.2	141.2	97.5	147.7	93.8	97.9	96.9	112.7	68.4	67.5	70.1
Factor of safety	1.6	1.5	1.4	1.4	1.5	1.6	1.6	1.4	1.2	1.4	1.4	1.5	1.5	1.5	1.4	1.3	1.5	1.5	1.5
	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

PERMANENT CASE

Manhole chamber ref	SWMH21.2	SWMH21.3	SWMH21.4	SWMH21.5	SWCP21.6	SWMH21.7
Diameter (m)	1.200	1.350	1.350	1.350	1.800	1.500
Chamber wall thickness (m)	0.090	0.095	0.095	0.095	0.115	0.100
Concrete surround (m)	0.150	0.150	0.150	0.150	0.150	0.150
Overall diameter (m)	1.680	1.840	1.840	1.840	2.330	2.000
CL (m AOD)	6.677	6.386	6.218	6.391	5.885	5.690
IL (m AOD)	4.785	4.610	4.325	4.270	3.745	4.170
Depth CL-IL (m)	1.892	1.776	1.893	2.121	2.140	1.520
Base thickness (m)	0.450	0.488	0.525	0.525	0.350	0.525
Overall depth (m)	2.342	2.264	2.418	2.646	2.490	2.045
Volume for buoyancy (m³)	5.189	6.016	6.426	7.032	10.612	6.421
Buoyancy uplift (kN)	51.9	60.2	64.3	70.3	106.1	64.2
Base solid volume (m³)	0.997	1.296	1.395	1.395	1.492	1.649
Cover construction depth (m)	0.250	0.250	0.250	0.250	0.250	0.250
Cover slab thickness (m)	0.150	0.170	0.170	0.170	0.175	0.175
Chamber ring depth (m)	1.492	1.356	1.473	1.701	1.715	1.095
Chamber ring outside dia. (m)	1.380	1.540	1.540	1.540	2.030	1.700
Chamber rings solid volume (m³)	0.544	0.584	0.635	0.733	1.186	0.550
Benching height (m)	0.400	0.400	0.400	0.400	0.400	0.400
Benching volume (m³)	0.226	0.286	0.286	0.286	0.509	0.353
Cover slab diameter (m)	1.450	1.580	1.580	1.580	2.070	1.740
Cover slab gross volume (m³)	0.248	0.333	0.333	0.333	0.589	0.416
Cover slab access void (m³)	0.068	0.077	0.077	0.077	0.080	0.080
Cover slab net volume (m³)	0.179	0.256	0.256	0.256	0.509	0.336
Concrete surround height (m)	1.642	1.526	1.643	1.871	1.890	1.270
Concrete surround volume (m³)	1.183	1.215	1.308	1.489	1.941	1.107
Total concrete volume (m³)	3.130	3.637	3.880	4.160	5.636	3.995
Total concrete weight (kN)	72.0	83.6	89.2	95.7	129.6	91.9
Surfacing gross volume (m³)	0.554	0.664	0.664	0.664	1.065	0.785
Access hole (m³)	0.114	0.114	0.114	0.114	0.114	0.114
Surfacing net volume (m³)	0.440	0.551	0.551	0.551	0.952	0.671
Total surfacing weight (kN)	8.8	11.0	11.0	11.0	19.0	13.4
Total chamber weight (kN)	80.8	94.7	100.2	106.7	148.7	105.3
Factor of safety	1.6	1.6	1.6	1.5	1.4	1.6
	OK	OK	OK	OK	OK	OK

TEMPORARY CASE [excluding cover and cover slab]

Depth for buoyancy (m)	1.942	1.844	1.998	2.226	2.065	1.620
Volume for buoyancy (m³)	4.303	4.899	5.310	5.916	8.800	5.087
Buoyancy uplift (kN)	43.0	49.0	53.1	59.2	88.0	50.9
Base solid volume (m³)	0.997	1.296	1.395	1.395	1.492	1.649
Chamber rings solid volume (m³)	0.544	0.584	0.635	0.733	1.186	0.550
Benching volume (m³)	0.226	0.286	0.286	0.286	0.509	0.353
Concrete surround height (m)	1.492	1.356	1.473	1.701	1.715	1.095
Concrete surround volume (m³)	1.075	1.079	1.172	1.354	1.761	0.954
Total concrete volume (m³)	2.842	3.246	3.489	3.769	4.947	3.506
Total concrete weight (kN)	65.4	74.6	80.2	86.7	113.8	80.6
Factor of safety	1.5	1.5	1.5	1.5	1.3	1.6
	OK	OK	OK	OK	OK	OK

PERMANENT CASE

Manhole chamber ref	FMH1.1	FMH1.2	FMH1.3	FMH1.4	FMH1.5	FMH1.6	FMH1.7	FMH1.8	FMH1.9	FMH1.10	FMH1.11	FMH1.12	FMH1.14	FMH1.15	FMH1.16	FMH2.1	FMH2.2
Diameter (m)	1.350	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.500	1.500	1.200	1.200	1.200	1.200	1.200
Chamber wall thickness (m)	0.095	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.100	0.100	0.090	0.090	0.090	0.090	0.090
Concrete surround (m)	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150
Overall diameter (m)	1.840	1.680	1.680	1.680	1.680	1.680	1.680	1.680	1.680	1.680	2.000	2.000	1.680	1.680	1.680	1.680	1.680
CL (m AOD)	7.099	7.295	7.326	6.830	6.642	7.014	7.447	7.541	7.655	7.052	6.955	6.890	6.656	6.017	6.463	7.012	6.651
IL (m AOD)	5.780	5.390	4.960	4.570	4.100	3.790	3.560	3.480	3.380	2.960	2.870	1.730	2.820	3.865	3.465	4.810	4.210
Depth CL-IL (m)	1.319	1.905	2.366	2.260	2.542	3.224	3.887	4.061	4.275	4.092	4.085	5.160	3.836	2.152	2.998	2.202	2.441
Base thickness (m)	0.350	0.350	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.350	0.350	0.350	0.375	0.375
Overall depth (m)	1.669	2.255	2.741	2.635	2.917	3.599	4.262	4.436	4.650	4.467	4.460	5.535	4.186	2.502	3.348	2.577	2.816
Volume for buoyancy (m³)	4.436	4.996	6.073	5.838	6.463	7.974	9.443	9.828	10.302	9.897	14.004	17.380	9.274	5.543	7.418	5.710	6.239
Buoyancy uplift (kN)	44.4	50.0	60.7	58.4	64.6	79.7	94.4	98.3	103.0	99.0	140.0	173.8	92.7	55.4	74.2	57.1	62.4
Base solid volume (m³)	0.930	0.775	0.831	0.831	0.831	0.831	0.831	0.831	0.831	0.831	1.178	1.178	0.775	0.775	0.775	0.831	0.831
Cover construction depth (m)	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
Cover slab thickness (m)	0.170	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.175	0.175	0.150	0.150	0.150	0.150	0.150
Chamber ring depth (m)	0.899	1.505	1.966	1.860	2.142	2.824	3.487	3.661	3.875	3.692	3.660	4.735	3.436	1.752	2.598	1.802	2.041
Chamber ring outside dia. (m)	1.540	1.380	1.380	1.380	1.380	1.380	1.380	1.380	1.380	1.380	1.700	1.700	1.380	1.380	1.380	1.380	1.380
Chamber rings solid volume (m³)	0.388	0.549	0.717	0.678	0.781	1.030	1.271	1.335	1.413	1.346	1.839	2.379	1.253	0.639	0.947	0.657	0.744
Benching height (m)	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400
Benching volume (m³)	0.286	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.353	0.353	0.226	0.226	0.226	0.226	0.226
Cover slab diameter (m)	1.580	1.450	1.450	1.450	1.450	1.450	1.450	1.450	1.450	1.450	1.740	1.740	1.450	1.450	1.450	1.450	1.450
Cover slab gross volume (m³)	0.333	0.248	0.248	0.248	0.248	0.248	0.248	0.248	0.248	0.248	0.416	0.416	0.248	0.248	0.248	0.248	0.248
Cover slab access void (m³)	0.077	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.080	0.080	0.068	0.068	0.068	0.068	0.068
Cover slab net volume (m³)	0.256	0.179	0.179	0.179	0.179	0.179	0.179	0.179	0.179	0.179	0.336	0.336	0.179	0.179	0.179	0.179	0.179
Concrete surround height (m)	1.069	1.655	2.116	2.010	2.292	2.974	3.637	3.811	4.025	3.842	3.835	4.910	3.586	1.902	2.748	1.952	2.191
Concrete surround volume (m³)	0.851	1.193	1.525	1.448	1.652	2.143	2.621	2.746	2.901	2.769	3.342	4.278	2.584	1.371	1.980	1.407	1.579
Total concrete volume (m³)	2.710	2.922	3.478	3.363	3.669	4.409	5.128	5.317	5.549	5.351	7.047	8.524	5.018	3.190	4.108	3.300	3.559
Total concrete weight (kN)	62.3	67.2	80.0	77.3	84.4	101.4	118.0	122.3	127.6	123.1	162.1	196.1	115.4	73.4	94.5	75.9	81.9
Surfacing gross volume (m³)	0.664	0.554	0.554	0.554	0.554	0.554	0.554	0.554	0.554	0.554	0.785	0.785	0.554	0.554	0.554	0.554	0.554
Access hole (m³)	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114
Surfacing net volume (m³)	0.551	0.440	0.440	0.440	0.440	0.440	0.440	0.440	0.440	0.440	0.671	0.671	0.440	0.440	0.440	0.440	0.440
Total surfacing weight (kN)	11.0	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	13.4	13.4	8.8	8.8	8.8	8.8	8.8
Total chamber weight (kN)	73.4	76.0	88.8	86.1	93.2	110.2	126.8	131.1	136.4	131.9	175.5	209.5	124.2	82.2	103.3	84.7	90.7
Factor of safety	1.7	1.5	1.5	1.5	1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.2	1.3	1.5	1.4	1.5	1.5
	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

TEMPORARY CASE [excluding cover and cover slab]

Depth for buoyancy (m)	1.249	1.855	2.341	2.235	2.517	3.199	3.862	4.036	4.250	4.067	4.035	5.110	3.786	2.102	2.948	2.177	2.416
Volume for buoyancy (m³)	3.319	4.110	5.187	4.952	5.577	7.088	8.557	8.942	9.416	9.011	12.670	16.045	8.388	4.657	6.532	4.823	5.353
Buoyancy uplift (kN)	33.2	41.1	51.9	49.5	55.8	70.9	85.6	89.4	94.2	90.1	126.7	160.5	83.9	46.6	65.3	48.2	53.5
Base solid volume (m³)	0.930	0.775	0.831	0.831	0.831	0.831	0.831	0.831	0.831	0.831	1.178	1.178	0.775	0.775	0.775	0.831	0.831
Chamber rings solid volume (m³)	0.388	0.549	0.717	0.678	0.781	1.030	1.271	1.335	1.413	1.346	1.839	2.379	1.253	0.639	0.947	0.657	0.744
Benching volume (m³)	0.286	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.353	0.353	0.226	0.226	0.226	0.226	0.226
Concrete surround height (m)	0.899	1.505	1.966	1.860	2.142	2.824	3.487	3.661	3.875	3.692	3.660	4.735	3.436	1.752	2.598	1.802	2.041
Concrete surround volume (m³)	0.716	1.085	1.417	1.340	1.544	2.035	2.513	2.638	2.792	2.661	3.189	4.126	2.476	1.263	1.872	1.299	1.471
Total concrete volume (m³)	2.319	2.635	3.190	3.075	3.381	4.121	4.841	5.030	5.262	5.063	6.559	8.035	4.730	2.903	3.821	3.012	3.272
Total concrete weight (kN)	53.3	60.6	73.4	70.7	77.8	94.8	111.3	115.7	121.0	116.5	150.8	184.8	108.8	66.8	87.9	69.3	75.3
Factor of safety	1.6	1.5	1.4	1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.3	1.4	1.3	1.4	1.4
	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

PERMANENT CASE

Manhole chamber ref	FMH2.3	FMH3.1	FMH4.1	FMH4.2	FMH5.1	FMH5.2	FMH5.3	FMH5.4	FMH5.5	FMH5.6	FMH5.7	FMH5.8	FMH5.9	FMH6.1	FMH6.2	FMH7.1	FMH7.2
Diameter (m)	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.350	1.200
Chamber wall thickness (m)	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.095	0.090
Concrete surround (m)	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150
Overall diameter (m)	1.680	1.680	1.680	1.680	1.680	1.680	1.680	1.680	1.680	1.680	1.680	1.680	1.680	1.680	1.680	1.840	1.680
CL (m AOD)	6.658	6.723	6.764	6.867	6.919	7.189	7.038	7.255	7.201	7.327	7.219	7.087	7.333	7.263	7.040	7.150	7.296
IL (m AOD)	4.150	4.590	4.780	4.190	5.420	5.010	4.740	4.530	4.390	4.170	4.050	3.910	3.650	5.500	4.780	5.680	5.070
Depth CL-IL (m)	2.508	2.133	1.984	2.677	1.499	2.179	2.298	2.725	2.811	3.157	3.169	3.177	3.683	1.763	2.260	1.470	2.226
Base thickness (m)	0.375	0.350	0.350	0.350	0.350	0.350	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.350	0.375	0.350	0.375
Overall depth (m)	2.883	2.483	2.334	3.027	1.849	2.529	2.673	3.100	3.186	3.532	3.544	3.552	4.058	2.113	2.635	1.820	2.601
Volume for buoyancy (m³)	6.388	5.501	5.171	6.707	4.097	5.603	5.922	6.868	7.059	7.825	7.852	7.870	8.991	4.682	5.838	4.837	5.763
Buoyancy uplift (kN)	63.9	55.0	51.7	67.1	41.0	56.0	59.2	68.7	70.6	78.3	78.5	78.7	89.9	46.8	58.4	48.4	57.6
Base solid volume (m³)	0.831	0.775	0.775	0.775	0.775	0.775	0.831	0.831	0.831	0.831	0.831	0.831	0.831	0.775	0.831	0.930	0.831
Cover construction depth (m)	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
Cover slab thickness (m)	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.170	0.150
Chamber ring depth (m)	2.108	1.733	1.584	2.277	1.099	1.779	1.898	2.325	2.411	2.757	2.769	2.777	3.283	1.363	1.860	1.050	1.826
Chamber ring outside dia. (m)	1.380	1.380	1.380	1.380	1.380	1.380	1.380	1.380	1.380	1.380	1.380	1.380	1.380	1.380	1.380	1.540	1.380
Chamber rings solid volume (m³)	0.768	0.632	0.577	0.830	0.401	0.649	0.692	0.848	0.879	1.005	1.009	1.012	1.197	0.497	0.678	0.453	0.666
Benching height (m)	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400
Benching volume (m³)	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.286	0.226
Cover slab diameter (m)	1.450	1.450	1.450	1.450	1.450	1.450	1.450	1.450	1.450	1.450	1.450	1.450	1.450	1.450	1.450	1.580	1.450
Cover slab gross volume (m³)	0.248	0.248	0.248	0.248	0.248	0.248	0.248	0.248	0.248	0.248	0.248	0.248	0.248	0.248	0.248	0.333	0.248
Cover slab access void (m³)	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.077	0.068
Cover slab net volume (m³)	0.179	0.179	0.179	0.179	0.179	0.179	0.179	0.179	0.179	0.179	0.179	0.179	0.179	0.179	0.179	0.256	0.179
Concrete surround height (m)	2.258	1.883	1.734	2.427	1.249	1.929	2.048	2.475	2.561	2.907	2.919	2.927	3.433	1.513	2.010	1.220	1.976
Concrete surround volume (m³)	1.627	1.357	1.250	1.749	0.900	1.390	1.476	1.784	1.846	2.095	2.104	2.109	2.474	1.090	1.448	0.971	1.424
Total concrete volume (m³)	3.632	3.169	3.008	3.760	2.481	3.219	3.404	3.867	3.961	4.336	4.349	4.358	4.907	2.768	3.363	2.896	3.326
Total concrete weight (kN)	83.5	72.9	69.2	86.5	57.1	74.0	78.3	88.9	91.1	99.7	100.0	100.2	112.9	63.7	77.3	66.6	76.5
Surfacing gross volume (m³)	0.554	0.554	0.554	0.554	0.554	0.554	0.554	0.554	0.554	0.554	0.554	0.554	0.554	0.554	0.554	0.664	0.554
Access hole (m³)	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114
Surfacing net volume (m³)	0.440	0.440	0.440	0.440	0.440	0.440	0.440	0.440	0.440	0.440	0.440	0.440	0.440	0.440	0.440	0.551	0.440
Total surfacing weight (kN)	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	11.0	8.8
Total chamber weight (kN)	92.3	81.7	78.0	95.3	65.9	82.8	87.1	97.7	99.9	108.5	108.8	109.0	121.7	72.5	86.1	77.6	85.3
Factor of safety	1.4	1.5	1.5	1.4	1.6	1.5	1.5	1.4	1.4	1.4	1.4	1.4	1.4	1.5	1.5	1.6	1.5
	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

TEMPORARY CASE [excluding cover and cover slab]

Depth for buoyancy (m)	2.483	2.083	1.934	2.627	1.449	2.129	2.273	2.700	2.786	3.132	3.144	3.152	3.658	1.713	2.235	1.400	2.201
Volume for buoyancy (m³)	5.501	4.615	4.285	5.820	3.210	4.717	5.036	5.982	6.173	6.939	6.966	6.984	8.105	3.795	4.952	3.721	4.877
Buoyancy uplift (kN)	55.0	46.2	42.8	58.2	32.1	47.2	50.4	59.8	61.7	69.4	69.7	69.8	81.0	38.0	49.5	37.2	48.8
Base solid volume (m³)	0.831	0.775	0.775	0.775	0.775	0.775	0.831	0.831	0.831	0.831	0.831	0.831	0.831	0.775	0.831	0.930	0.831
Chamber rings solid volume (m³)	0.768	0.632	0.577	0.830	0.401	0.649	0.692	0.848	0.879	1.005	1.009	1.012	1.197	0.497	0.678	0.453	0.666
Benching volume (m³)	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.286	0.226
Concrete surround height (m)	2.108	1.733	1.584	2.277	1.099	1.779	1.898	2.325	2.411	2.757	2.769	2.777	3.283	1.363	1.860	1.050	1.826
Concrete surround volume (m³)	1.519	1.249	1.141	1.641	0.792	1.282	1.368	1.675	1.737	1.987	1.995	2.001	2.366	0.982	1.340	0.836	1.316
Total concrete volume (m³)	3.344	2.882	2.720	3.472	2.194	2.932	3.117	3.580	3.673	4.049	4.062	4.070	4.620	2.481	3.075	2.505	3.038
Total concrete weight (kN)	76.9	66.3	62.6	79.9	50.5	67.4	71.7	82.3	84.5	93.1	93.4	93.6	106.3	57.1	70.7	57.6	69.9
Factor of safety	1.4	1.4	1.5	1.4	1.6	1.4	1.4	1.4	1.4	1.3	1.3	1.3	1.3	1.5	1.4	1.5	1.4
	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

PERMANENT CASE

Manhole chamber ref	FMH7.3	FMH7.4	FMH7.5	FMH7.6	FMH7.7	FMH8.1	FMH8.2	FMH8.3	FMH9.1	FMH9.2	FMH9.3	FMH9.4	FMH10.1	FMH10.2	FMH10.3	FMH10.4	FMH10.5
Diameter (m)	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.350	1.200	1.200	1.200	1.200
Chamber wall thickness (m)	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.095	0.090	0.090	0.090	0.090
Concrete surround (m)	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150
Overall diameter (m)	1.680	1.680	1.680	1.680	1.680	1.680	1.680	1.680	1.680	1.680	1.680	1.680	1.840	1.680	1.680	1.680	1.680
CL (m AOD)	7.413	7.483	7.550	7.384	7.100	7.552	7.581	7.379	7.682	7.590	7.416	7.235	6.447	6.051	6.378	6.542	6.354
IL (m AOD)	4.650	4.600	4.540	4.450	4.260	5.320	5.120	4.810	4.400	4.250	4.030	3.875	5.230	4.190	3.730	3.600	3.400
Depth CL-IL (m)	2.763	2.883	3.010	2.934	2.840	2.232	2.461	2.569	3.282	3.340	3.386	3.360	1.217	1.861	2.648	2.942	2.954
Base thickness (m)	0.375	0.375	0.375	0.375	0.375	0.350	0.350	0.375	0.375	0.375	0.375	0.375	0.350	0.350	0.375	0.375	0.375
Overall depth (m)	3.138	3.258	3.385	3.309	3.215	2.582	2.811	2.944	3.657	3.715	3.761	3.735	1.567	2.211	3.023	3.317	3.329
Volume for buoyancy (m³)	6.953	7.218	7.500	7.331	7.123	5.721	6.228	6.523	8.102	8.231	8.333	8.275	4.165	4.899	6.698	7.349	7.376
Buoyancy uplift (kN)	69.5	72.2	75.0	73.3	71.2	57.2	62.3	65.2	81.0	82.3	83.3	82.8	41.6	49.0	67.0	73.5	73.8
Base solid volume (m³)	0.831	0.831	0.831	0.831	0.831	0.775	0.775	0.831	0.831	0.831	0.831	0.831	0.930	0.775	0.831	0.831	0.831
Cover construction depth (m)	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
Cover slab thickness (m)	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.170	0.150	0.150	0.150	0.150
Chamber ring depth (m)	2.363	2.483	2.610	2.534	2.440	1.832	2.061	2.169	2.882	2.940	2.986	2.960	0.797	1.461	2.248	2.542	2.554
Chamber ring outside dia. (m)	1.380	1.380	1.380	1.380	1.380	1.380	1.380	1.380	1.380	1.380	1.380	1.380	1.540	1.380	1.380	1.380	1.380
Chamber rings solid volume (m³)	0.861	0.905	0.951	0.924	0.890	0.668	0.751	0.791	1.051	1.072	1.089	1.079	0.344	0.533	0.820	0.927	0.931
Benching height (m)	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400
Benching volume (m³)	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.286	0.226	0.226	0.226	0.226
Cover slab diameter (m)	1.450	1.450	1.450	1.450	1.450	1.450	1.450	1.450	1.450	1.450	1.450	1.450	1.580	1.450	1.450	1.450	1.450
Cover slab gross volume (m³)	0.248	0.248	0.248	0.248	0.248	0.248	0.248	0.248	0.248	0.248	0.248	0.248	0.333	0.248	0.248	0.248	0.248
Cover slab access void (m³)	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.077	0.068	0.068	0.068	0.068
Cover slab net volume (m³)	0.179	0.179	0.179	0.179	0.179	0.179	0.179	0.179	0.179	0.179	0.179	0.179	0.256	0.179	0.179	0.179	0.179
Concrete surround height (m)	2.513	2.633	2.760	2.684	2.590	1.982	2.211	2.319	3.032	3.090	3.136	3.110	0.967	1.611	2.398	2.692	2.704
Concrete surround volume (m³)	1.811	1.897	1.989	1.934	1.866	1.428	1.593	1.671	2.185	2.227	2.260	2.241	0.770	1.161	1.728	1.940	1.949
Total concrete volume (m³)	3.909	4.039	4.177	4.094	3.992	3.277	3.525	3.698	4.472	4.535	4.585	4.556	2.585	2.874	3.784	4.103	4.116
Total concrete weight (kN)	89.9	92.9	96.1	94.2	91.8	75.4	81.1	85.1	102.9	104.3	105.4	104.8	59.5	66.1	87.0	94.4	94.7
Surfacing gross volume (m³)	0.554	0.554	0.554	0.554	0.554	0.554	0.554	0.554	0.554	0.554	0.554	0.554	0.664	0.554	0.554	0.554	0.554
Access hole (m³)	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114
Surfacing net volume (m³)	0.440	0.440	0.440	0.440	0.440	0.440	0.440	0.440	0.440	0.440	0.440	0.440	0.551	0.440	0.440	0.440	0.440
Total surfacing weight (kN)	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	11.0	8.8	8.8	8.8	8.8
Total chamber weight (kN)	98.7	101.7	104.9	103.0	100.6	84.2	89.9	93.9	111.6	113.1	114.2	113.6	70.5	74.9	95.8	103.2	103.5
Factor of safety	1.4	1.4	1.4	1.4	1.4	1.5	1.4	1.4	1.4	1.4	1.4	1.4	1.7	1.5	1.4	1.4	1.4
	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

TEMPORARY CASE [excluding cover and cover slab]

Depth for buoyancy (m)	2.738	2.858	2.985	2.909	2.815	2.182	2.411	2.544	3.257	3.315	3.361	3.335	1.147	1.811	2.623	2.917	2.929
Volume for buoyancy (m³)	6.066	6.332	6.614	6.445	6.237	4.834	5.342	5.636	7.216	7.345	7.447	7.389	3.048	4.012	5.811	6.463	6.489
Buoyancy uplift (kN)	60.7	63.3	66.1	64.5	62.4	48.3	53.4	56.4	72.2	73.4	74.5	73.9	30.5	40.1	58.1	64.6	64.9
Base solid volume (m³)	0.831	0.831	0.831	0.831	0.831	0.775	0.775	0.831	0.831	0.831	0.831	0.831	0.930	0.775	0.831	0.831	0.831
Chamber rings solid volume (m³)	0.861	0.905	0.951	0.924	0.890	0.668	0.751	0.791	1.051	1.072	1.089	1.079	0.344	0.533	0.820	0.927	0.931
Benching volume (m³)	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.286	0.226	0.226	0.226	0.226
Concrete surround height (m)	2.363	2.483	2.610	2.534	2.440	1.832	2.061	2.169	2.882	2.940	2.986	2.960	0.797	1.461	2.248	2.542	2.554
Concrete surround volume (m³)	1.703	1.789	1.881	1.826	1.758	1.320	1.485	1.563	2.077	2.119	2.152	2.133	0.634	1.053	1.620	1.832	1.840
Total concrete volume (m³)	3.621	3.751	3.889	3.807	3.705	2.990	3.238	3.411	4.184	4.247	4.297	4.269	2.194	2.587	3.496	3.815	3.828
Total concrete weight (kN)	83.3	86.3	89.5	87.6	85.2	68.8	74.5	78.4	96.2	97.7	98.8	98.2	50.5	59.5	80.4	87.8	88.1
Factor of safety	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.3	1.3	1.3	1.3	1.7	1.5	1.4	1.4	1.4
	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

PERMANENT CASE

Manhole chamber ref	FMH10.6	FMH10.7	FMH10.8	FMH10.9	FMH10.10	FMH10.11	FMH10.12	FMH10.13	FMH10.14	FMH10.15	FMH10.16	FMH11.1
Diameter (m)	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.500	1.500	1.200
Chamber wall thickness (m)	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.100	0.100	0.090
Concrete surround (m)	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150
Overall diameter (m)	1.680	1.680	1.680	1.680	1.680	1.680	1.680	1.680	1.680	2.000	2.000	1.680
CL (m AOD)	6.406	6.470	6.554	6.356	6.227	6.004	6.121	6.343	6.885	6.802	6.768	6.330
IL (m AOD)	3.280	3.230	3.170	3.060	2.970	2.810	2.680	2.530	2.140	2.050	1.830	3.850
Depth CL-IL (m)	3.126	3.240	3.384	3.296	3.257	3.194	3.441	3.813	4.745	4.752	4.938	2.480
Base thickness (m)	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375
Overall depth (m)	3.501	3.615	3.759	3.671	3.632	3.569	3.816	4.188	5.120	5.127	5.313	2.855
Volume for buoyancy (m³)	7.757	8.009	8.328	8.133	8.047	7.907	8.455	9.279	11.344	16.099	16.683	6.325
Buoyancy uplift (kN)	77.6	80.1	83.3	81.3	80.5	79.1	84.5	92.8	113.4	161.0	166.8	63.3
Base solid volume (m³)	0.831	0.831	0.831	0.831	0.831	0.831	0.831	0.831	0.831	1.178	1.178	0.831
Cover construction depth (m)	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
Cover slab thickness (m)	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.175	0.175	0.150
Chamber ring depth (m)	2.726	2.840	2.984	2.896	2.857	2.794	3.041	3.413	4.345	4.327	4.513	2.080
Chamber ring outside dia. (m)	1.380	1.380	1.380	1.380	1.380	1.380	1.380	1.380	1.380	1.700	1.700	1.380
Chamber rings solid volume (m³)	0.994	1.035	1.088	1.056	1.042	1.019	1.109	1.244	1.584	2.174	2.267	0.758
Benching height (m)	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400
Benching volume (m³)	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.353	0.353	0.226
Cover slab diameter (m)	1.450	1.450	1.450	1.450	1.450	1.450	1.450	1.450	1.450	1.740	1.740	1.450
Cover slab gross volume (m³)	0.248	0.248	0.248	0.248	0.248	0.248	0.248	0.248	0.248	0.416	0.416	0.248
Cover slab access void (m³)	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.080	0.080	0.068
Cover slab net volume (m³)	0.179	0.179	0.179	0.179	0.179	0.179	0.179	0.179	0.179	0.336	0.336	0.179
Concrete surround height (m)	2.876	2.990	3.134	3.046	3.007	2.944	3.191	3.563	4.495	4.502	4.688	2.230
Concrete surround volume (m³)	2.073	2.155	2.258	2.195	2.167	2.122	2.300	2.568	3.239	3.923	4.085	1.607
Total concrete volume (m³)	4.302	4.426	4.582	4.487	4.445	4.376	4.644	5.048	6.059	7.964	8.219	3.601
Total concrete weight (kN)	99.0	101.8	105.4	103.2	102.2	100.7	106.8	116.1	139.4	183.2	189.0	82.8
Surfacing gross volume (m³)	0.554	0.554	0.554	0.554	0.554	0.554	0.554	0.554	0.554	0.785	0.785	0.554
Access hole (m³)	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114
Surfacing net volume (m³)	0.440	0.440	0.440	0.440	0.440	0.440	0.440	0.440	0.440	0.671	0.671	0.440
Total surfacing weight (kN)	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	13.4	13.4	8.8
Total chamber weight (kN)	107.8	110.6	114.2	112.0	111.0	109.5	115.6	124.9	148.2	196.6	202.5	91.6
Factor of safety	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.3	1.3	1.2	1.2	1.4
	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

TEMPORARY CASE [excluding cover and cover slab]

Depth for buoyancy (m)	3.101	3.215	3.359	3.271	3.232	3.169	3.416	3.788	4.720	4.702	4.888	2.455
Volume for buoyancy (m³)	6.871	7.123	7.442	7.247	7.161	7.021	7.568	8.393	10.458	14.764	15.348	5.439
Buoyancy uplift (kN)	68.7	71.2	74.4	72.5	71.6	70.2	75.7	83.9	104.6	147.6	153.5	54.4
Base solid volume (m³)	0.831	0.831	0.831	0.831	0.831	0.831	0.831	0.831	0.831	1.178	1.178	0.831
Chamber rings solid volume (m³)	0.994	1.035	1.088	1.056	1.042	1.019	1.109	1.244	1.584	2.174	2.267	0.758
Benching volume (m³)	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.226	0.353	0.353	0.226
Concrete surround height (m)	2.726	2.840	2.984	2.896	2.857	2.794	3.041	3.413	4.345	4.327	4.513	2.080
Concrete surround volume (m³)	1.964	2.047	2.150	2.087	2.059	2.013	2.191	2.460	3.131	3.770	3.932	1.499
Total concrete volume (m³)	4.015	4.139	4.295	4.200	4.157	4.089	4.357	4.761	5.772	7.475	7.730	3.314
Total concrete weight (kN)	92.3	95.2	98.8	96.6	95.6	94.0	100.2	109.5	132.8	171.9	177.8	76.2
Factor of safety	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.4
	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK