VENTILATED FACADES

MFT-FOX VTR

Load tables
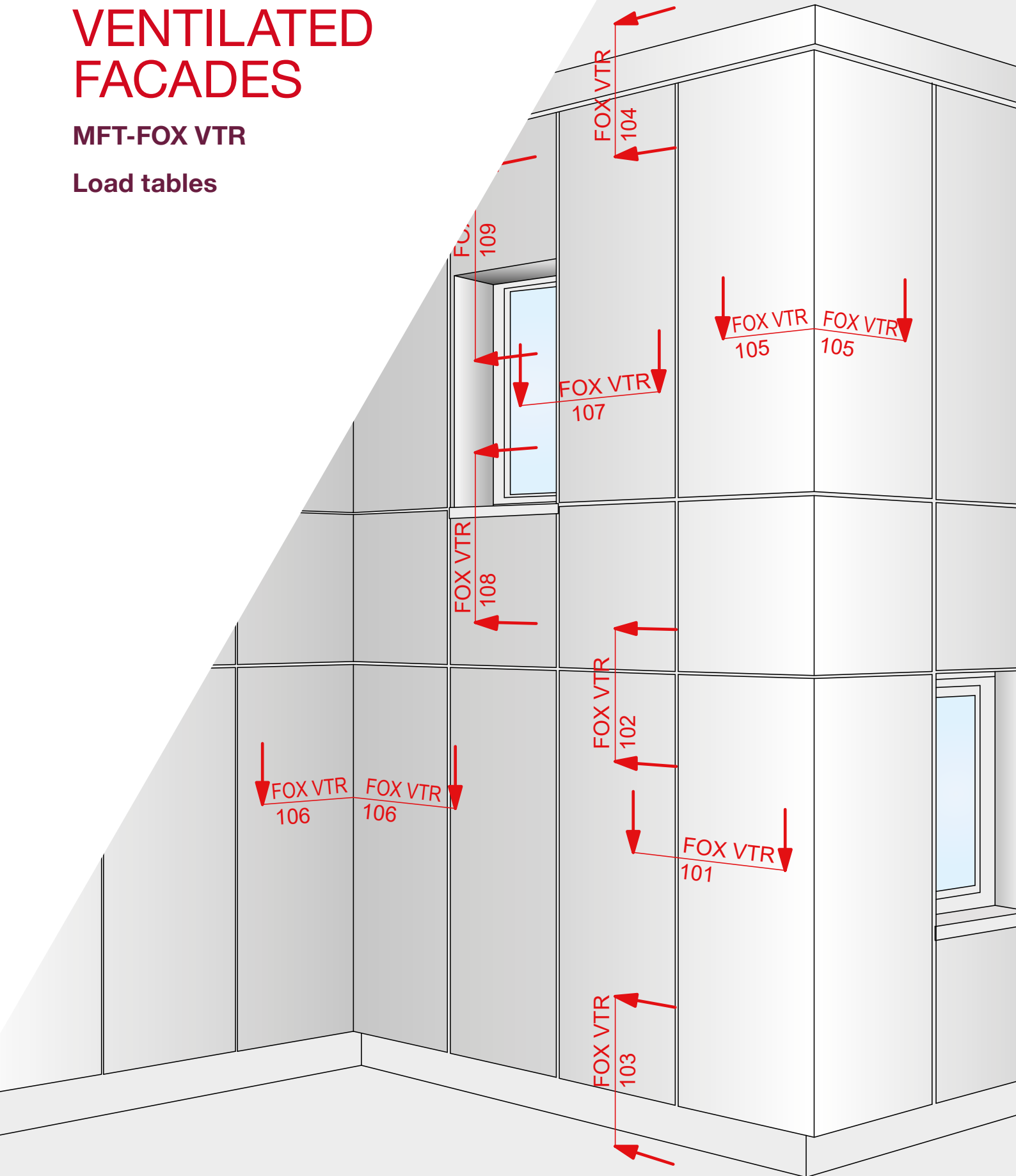
CONTENTS AND OVERVIEW OF LOAD TABLES

This is an interactive page! Click on the content you want to see to go to the relevant page.

FOX VTR BRACKET RESISTANCE ANALYSIS

Introduction

The bracket resistance was determined by using numerical 3D Finite Element Analysis for each different bracket size (Medium and Large). The obtained results are summarized in load interaction diagrams providing the reaction force values corresponding to the considered failure criteria:

- Plastic deformation of ~20%
- Buckling
- "Nonconvergence"
- Predefined displacement limit – max [3 mm, (bracket length / 50) mm]

Modelling approach

- Load application: remote displacement at a predefined position
- Rigid remote point was connected to the surfaces. The remote point was at the origin of the predefined coordinate system.
- Displacements were applied at the same point.
- The rotations around x- and z-axes were fixed.
- Outer surfaces of the base were fixed in all directions
- Gravity acts always in +z direction.
- In all the simulations the first load case considers only a gravity.

The first group of simulations was evaluated with design loads (100% dead load of 580 N, and 100% wind load of +/- 864 N). The loads were increased until any of the above mentioned failure criteria was reached.

The second group of simulations considered different load cases, where load case (1) accounts only for the dead load, while other load cases (2)-(5) consider also the wind load. Both wind loads uplift (suction) and pressure were considered.
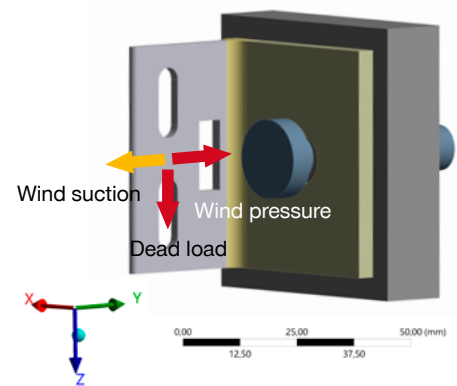
Combination of dead and wind load for different load cases.

Index	Dead load	Wind
(1)	1.0	0.0
(2)	1.0	0.415
(3)	1.0	1.0
(4)	0.415	1.0
(5)	0.0	1.0

Three load steps in all cases:

- LS 0: Standard earth gravity (acts in all steps)
- LS 1: Apply load as described on the table above
- LS 2: Increase both loads proportional by factors until the load bearing capacity is reached

The simulation is displacement driven and the ratio between dead and wind load is applied in case of the corresponding input displacement values. The ratio is not applicable to the reaction forces after the simulation.
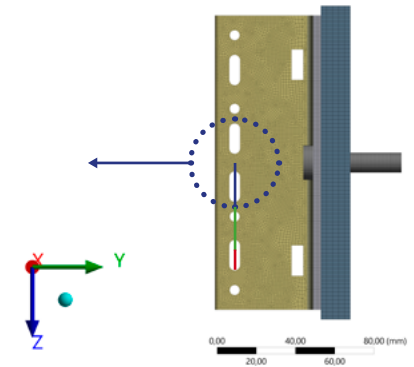
This is an interactive page! Click on the move-back button to jump back to the CONTENT AND OVERVIEW.

www.hilti.group   MFT-FOX VTR – Load tables   04/2022   3

In both approaches (with and without reached failure criteria) simulations were displacement driven at the predefined load position and the evaluated value is the reaction force, which was measured at the load application point. Additionally, safety factors of 1.35 for dead load and 1.5 for wind load resistance were applied.

Results and explanation of the interaction diagram

The numerically obtained results are presented in an interaction diagram with three axes (dead load, wind uplift and wind pressure). The maximum resistance for each load case (LC) was determined and it is shown in the diagram below. Different load combinations can be determined with interpolation between two points.

The reaction force is evaluated at the load application remote point.
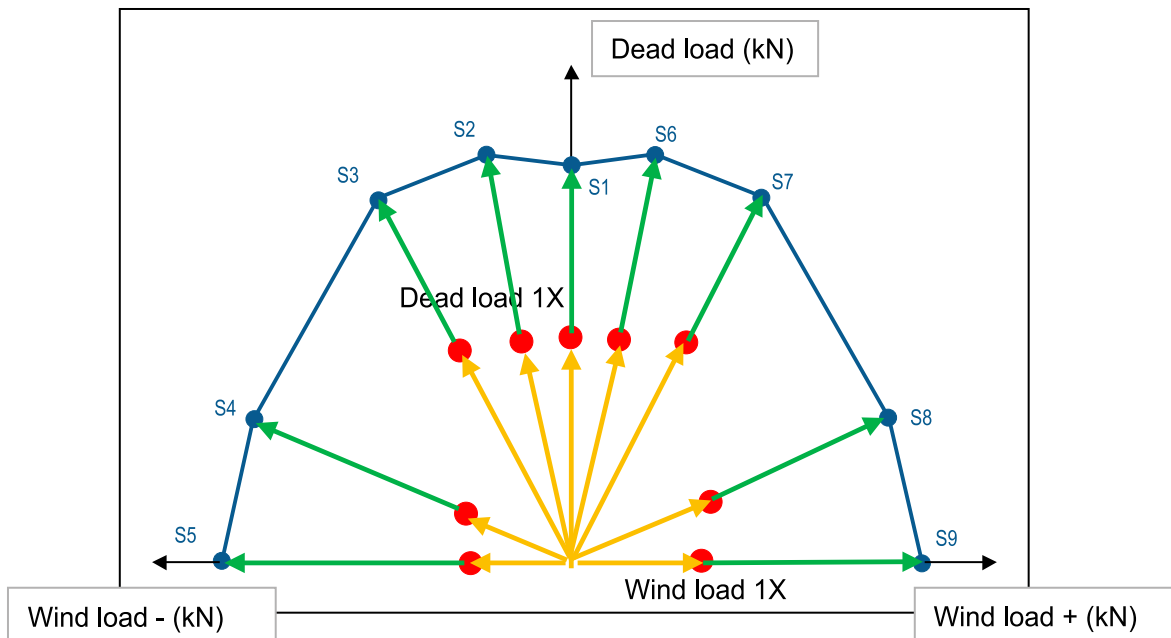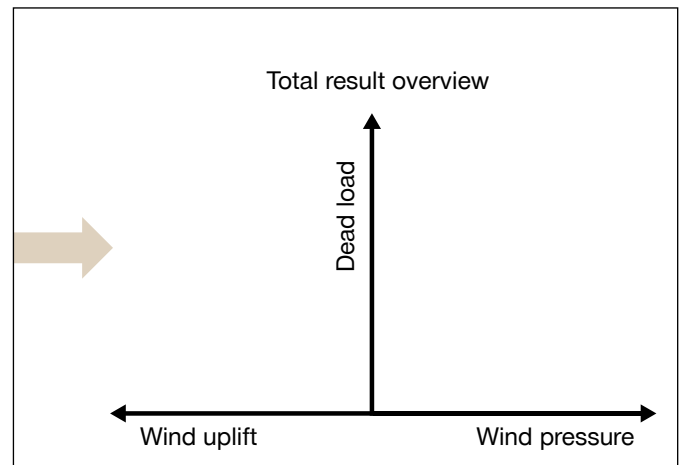
The red points represent 100% dead and wind load (design load). Beyond that point, the displacement load was applied until one of the above mentioned failure criteria was reached. In graph it is considered that after the system reaches nonlinear behavior, the forces do not increase with the same intensity and therefore the green arrows will not be straightened for a symmetrical graph.

BRACKET LOAD TABLE: MFT-FOX VTR MEDIUM

Base material: Concrete
Bracket Base Fastener: 1 Anchor
Bracket-Profile Fastener: 2 Screws

	FOX VTR 60 M 6.5/11		FOX VTR 80 M 6.5/11		FOX VTR 100 M 6.5/11		FOX VTR 120 M 6.5/11		FOX VTR 140 M 6.5/11		FOX VTR 160 M 6.5/11	
	Wind Load	Dead Load	Wind Load	Dead Load	Wind Load	Dead Load	Wind Load	Dead Load	Wind Load	Dead Load	Wind Load	Dead Load
S1	0	6901	0	5747.5	0	4594	0	3610.5	0	2627	0	2267
S2	-1992	7163	-2066.5	5936.5	-2141	4710	-2150	3774.5	-2159	2839	-2249	2488.5
S3	-2634	6234	-2754.5	5472	-2875	4710	-2786	3774.5	-2697	2839	-2803	2488.5
S4	-3186	4772	-3220.5	4725.5	-3255	4679	-3135	3759	-3015	2839	-3045.5	2487.5
S5	-3617	0	-3620.5	0	-3624	0	-3560	0	-3496	0	-3514.5	0
S6	5317	6439	4645	5216	3973	3993	3632.5	3006.5	3292	2020	3025	1648
S7	6420	5531	5740.5	4358.5	5061	3186	4589	2202	4117	1218	3711	998
S8	7178	3803	6472.5	2734.5	5767	1666	5071	1131	4375	596	3930.5	467.5
S9	7645	0	6832.5	0	6020	0	5248.5	0	4477	0	4002	0

	FOX VTR 180 M 6.5/11		FOX VTR 200 M 6.5/11		FOX VTR 220 M 6.5/11		FOX VTR 240 M 6.5/11		FOX VTR 260 M 6.5/11		FOX VTR 280 M 6.5/11		FOX VTR 300 M 6.5/11	
	Wind Load	Dead Load	Wind Load	Dead Load	Wind Load	Dead Load	Wind Load	Dead Load	Wind Load	Dead Load	Wind Load	Dead Load	Wind Load	Dead Load
S1	0	1907	0	1675	0	1443	0	1302	0	1161	0	1037.5	0	914
S2	-2339	2138	-2510.5	1923	-2682	1708	-2906	1715	-3130	1722	-3184	1452	-3238	1182
S3	-2909	2138	-3030.5	1923	-3152	1708	-3286.5	1604	-3421	1500	-3452.5	1341	-3484	1182
S4	-3076	2136	-3211.5	1860	-3347	1584	-3384	1420.5	-3421	1257	-3452.5	1166.5	-3484	1076
S5	-3533	0	-3489.5	0	-3446	0	-3492.5	0	-3539	0	-3514.5	0	-3490	0
S6	2758	1276	2486.5	1078.5	2215	881	1983	740.5	1751	600	1570	512.5	1389	425
S7	3305	778	2944.5	612	2584	446	2293	394.5	2002	343	1785.5	308.5	1569	274
S8	3486	339	3085	286.5	2684	234	2375.5	201	2067	168	1841	152.5	1615	137
S9	3527	0	3119	0	2711	0	2396	0	2081	0	1854	0	1627	0

Values are incl. safety factors, for dead load is 1.35 and for wind load is 1.50.

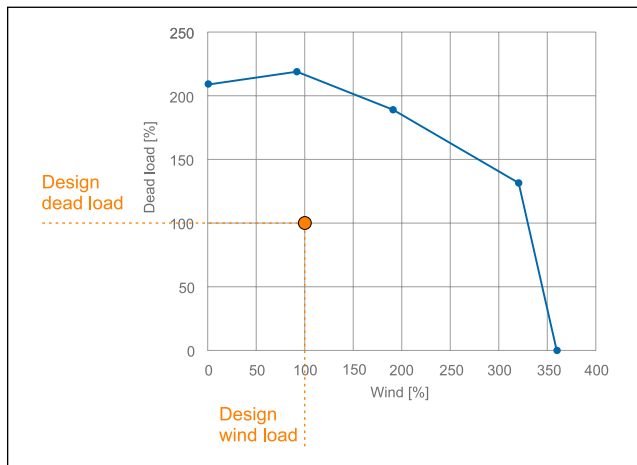This is an interactive page! Click on the move-back button to jump back to the CONTENT AND OVERVIEW.

BRACKET LOAD TABLE:
MFT-FOX VTR MEDIUM

Base material: Steel
Bracket Base Fastener: 2 Screws
Bracket-Profile Fastener: 2 Screws

	FOX VTR 60 M 6.5/11		FOX VTR 80 M 6.5/11		FOX VTR 100 M 6.5/11		FOX VTR 120 M 6.5/11		FOX VTR 140 M 6.5/11		FOX VTR 160 M 6.5/11	
	Wind Load	Dead Load	Wind Load	Dead Load	Wind Load	Dead Load	Wind Load	Dead Load	Wind Load	Dead Load	Wind Load	Dead Load
S1	0	9268	0	7274	0	5280	0	4085.5	0	2891	0	2493
S2	-1235	9453	-1657.5	7493.5	-2080	5534	-2042	4316	-2004	3098	-2235	2709.5
S3	-2024	9453	-2403	7493.5	-2782	5534	-2758.5	4316	-2735	3098	-2889	2709.5
S4	-2809	9241	-2831	7387.5	-2853	5534	-2794	4301.5	-2735	3069	-2889	2453.5
S5	-3502	0	-3443	0	-3384	0	-3268.5	0	-3153	0	-3244	0
S6	4292	8439	4035	6478.5	3778	4518	3600.5	3324.5	3423	2131	3148.5	1745.5
S7	6136	6716	5717	4866	5298	3016	4844	2100.5	4390	1185	3955	914.5
S8	7393	3885	6688	2769.5	5983	1654	5311	1092	4639	530	4148.5	429
S9	7902	0	7073.5	0	6245	0	5470	0	4695	0	4197.5	0

	FOX VTR 180 M 6.5/11		FOX VTR 200 M 6.5/11		FOX VTR 220 M 6.5/11		FOX VTR 240 M 6.5/11		FOX VTR 260 M 6.5/11		FOX VTR 280 M 6.5/11		FOX VTR 300 M 6.5/11	
	Wind Load	Dead Load	Wind Load	Dead Load	Wind Load	Dead Load	Wind Load	Dead Load	Wind Load	Dead Load	Wind Load	Dead Load	Wind Load	Dead Load
S1	0	2095	0	1838	0	1581	0	1421	0	1261	0	1133	0	1005
S2	-2466	2321	-2489	2083	-2512	1845	-2795.5	1670	-3079	1495	-2969	1375.5	-2859	1256
S3	-3043	2321	-3037.5	2083	-3032	1845	-3075.5	1670	-3119	1495	-2989	1343.5	-2859	1192
S4	-3043	1838	-3037.5	1566	-3032	1294	-3075.5	1101	-3119	908	-3154	773	-3189	638
S5	-3335	0	-3305	0	-3275	0	-3324	0	-3373	0	-3289	0	-3205	0
S6	2874	1360	2589	1124.5	2304	889	2059	772	1814	655	1626	570.5	1438	486
S7	3520	644	3118	547	2716	450	2389.5	403.5	2063	357	1832.5	337	1602	317
S8	3658	328	3233	251	2808	174	2472.5	170	2137	166	1895.5	153.5	1654	141
S9	3700	0	3264.5	0	2829	0	2491	0	2153	0	1910	0	1667	0

Values are incl. safety factors, for dead load is 1.35 and for wind load is 1.50.

BRACKET LOAD TABLE: MFT-FOX VTR LARGE

Base material: Concrete
Bracket Base Fastener: 1 Anchor
Bracket-Profile Fastener: 2 Screws

	FOX VTR 60 L 6.5/11		FOX VTR 80 L 6.5/11		FOX VTR 100 L 6.5/11		FOX VTR 120 L 6.5/11		FOX VTR 140 L 6.5/11		FOX VTR 160 L 6.5/11	
	Wind Load	Dead Load	Wind Load	Dead Load	Wind Load	Dead Load	Wind Load	Dead Load	Wind Load	Dead Load	Wind Load	Dead Load
S1	0	7798	0	7412.5	0	7027	0	5938.5	0	4850	0	4212.5
S2	-2082	7313	-2426.5	6817	-2771	6321	-2849.5	5405	-2928	4489	-2844.5	4066.5
S3	-2921	6600	-3086	6460.5	-3251	6321	-3397.5	5405	-3544	4489	-3457.5	4066.5
S4	-3562	5073	-3597.5	5148.5	-3633	5224	-3890.5	4856.5	-4148	4489	-4050.5	4066.5
S5	-4114	0	-4040	0	-3966	0	-4195	0	-4424	0	-4188.5	0
S6	6438	9996	5441.5	8394	4445	6792	4044.5	5488	3644	4184	3389	3552
S7	8120	9837	7084.5	7742.5	6049	5648	5539	4398	5029	3148	4619.5	2594
S8	9030	7907	8132	5718	7234	3529	6468	2539.5	5702	1550	5173	1295.5
S9	9706	0	8747	0	7788	0	6877	0	5966	0	5371.5	0

	FOX VTR 180 L 6.5/11		FOX VTR 200 L 6.5/11		FOX VTR 220 L 6.5/11		FOX VTR 240 L 6.5/11		FOX VTR 260 L 6.5/11		FOX VTR 280 L 6.5/11		FOX VTR 300 L 6.5/11	
	Wind Load	Dead Load	Wind Load	Dead Load	Wind Load	Dead Load	Wind Load	Dead Load	Wind Load	Dead Load	Wind Load	Dead Load	Wind Load	Dead Load
S1	0	3575	0	3170.5	0	2766	0	2538.5	0	2311	0	2067.5	0	1824
S2	-2761	3644	-2966	3271	-3171	2898	-3648.5	2695	-4126	2492	-4380.5	2312.5	-4635	2133
S3	-3371	3644	-3710.5	3271	-4050	2898	-4098.5	2695	-4147	2492	-4769	2312.5	-5391	2133
S4	-3953	3644	-4118	3271	-4283	2898	-4215	2695	-4147	2492	-4782	2312.5	-5417	2133
S5	-3953	0	-4484	0	-5015	0	-4594.5	0	-4174	0	-4806	0	-5438	0
S6	3134	2920	2896	2499.5	2658	2079	2490.5	1847	2323	1615	2111.5	1410	1900	1205
S7	4210	2040	3833.5	1684	3457	1328	3182	1130	2907	932	2621	821	2335	710
S8	4644	1041	4182	857	3720	673	3399.5	572	3079	471	2767.5	407.5	2456	344
S9	4777	0	4287.5	0	3798	0	3462.5	0	3127	0	2808.5	0	2490	0

Values are incl. safety factors, for dead load is 1.35 and for wind load is 1.50.

This is an interactive page! Click on the move-back button to jump back to the CONTENT AND OVERVIEW.

BRACKET LOAD TABLE: MFT-FOX VTR LARGE

Base material: Concrete
Bracket Base Fastener: 2 Anchor
Bracket-Profile Fastener: 2 Screws

	FOX VTR 60 L 6.5/11		FOX VTR 80 L 6.5/11		FOX VTR 100 L 6.5/11		FOX VTR 120 L 6.5/11		FOX VTR 140 L 6.5/11		FOX VTR 160 L 6.5/11	
	Wind Load	Dead Load	Wind Load	Dead Load	Wind Load	Dead Load	Wind Load	Dead Load	Wind Load	Dead Load	Wind Load	Dead Load
S1	0	17162	0	13687	0	10212	0	8078.5	0	5945	0	5149
S2	-1632	17764	-2230	14218.5	-2828	10673	-2867.5	8397.5	-2907	6122	-3286	5350.5
S3	-2647	17764	-2868.5	14218.5	-3090	10673	-3247.5	8397.5	-3405	6122	-3848.5	5350.5
S4	-4714	17764	-4488	14218.5	-4262	10673	-4243.5	8397.5	-4225	6122	-4223.5	5350.5
S5	-6559	0	-6481.5	0	-6404	0	-6391	0	-6378	0	-6391.5	0
S6	4747	12240	4526	10109.5	4305	7979	4245	6537.5	4185	5096	3964.5	4285.5
S7	7888	12964	7407.5	10067.5	6927	7171	6498	5181.5	6069	3192	5562	2612
S8	10492	8573	9589.5	6051	8687	3529	7813	2498	6939	1467	6254.5	1167
S9	11412	0	10346.5	0	9281	0	8221.5	0	7162	0	6424.5	0

	FOX VTR 180 L 6.5/11		FOX VTR 200 L 6.5/11		FOX VTR 220 L 6.5/11		FOX VTR 240 L 6.5/11		FOX VTR 260 L 6.5/11		FOX VTR 280 L 6.5/11		FOX VTR 300 L 6.5/11	
	Wind Load	Dead Load	Wind Load	Dead Load	Wind Load	Dead Load	Wind Load	Dead Load	Wind Load	Dead Load	Wind Load	Dead Load	Wind Load	Dead Load
S1	0	4353	0	3889	0	3425	0	3147.5	0	2870	0	2573.5	0	2277
S2	-3665	4579	-4228.5	4140.5	-4792	3702	-5452.5	3412.5	-6113	3123	-6316	2890.5	-6519	2658
S3	-4292	4579	-5830	4140.5	-7368	3702	-6781.5	3412.5	-6195	3123	-6357.5	2890.5	-6520	2658
S4	-4222	4579	-5795	4140.5	-7368	3702	-6781.5	3292	-6195	2882	-6357.5	2622	-6520	2362
S5	-6405	0	-7093	0	-7781	0	-6997.5	0	-6214	0	-6416.5	0	-6619	0
S6	3744	3475	3469	2950	3194	2425	2990.5	2175.5	2787	1926	2524.5	1693.5	2262	1461
S7	5055	2032	4543.5	1732.5	4032	1433	3658	1285	3284	1137	2931	1034.5	2578	932
S8	5570	867	4943	835	4316	803	3895.5	644	3475	485	3083.5	445.5	2692	406
S9	5687	0	5037.5	0	4388	0	3952.5	0	3517	0	3119	0	2721	0

Values are incl. safety factors, for dead load is 1.35 and for wind load is 1.50.

BRACKET LOAD TABLE:
MFT-FOX VTR LARGE

Base material: Steel
Bracket Base Fastener: 2 Screws
Bracket-Profile Fastener: 2 Screws

	FOX VTR 60 L 6.5/11		FOX VTR 80 L 6.5/11		FOX VTR 100 L 6.5/11		FOX VTR 120 L 6.5/11		FOX VTR 140 L 6.5/11		FOX VTR 160 L 6.5/11	
	Wind Load	Dead Load	Wind Load	Dead Load	Wind Load	Dead Load	Wind Load	Dead Load	Wind Load	Dead Load	Wind Load	Dead Load
S1	0	16800	0	13170.5	0	9541	0	7573	0	5605	0	4873.5
S2	-1542	16696	-2213	13354.5	-2884	10013	-2997.5	7972	-3111	5931	-3342.5	5150.5
S3	-2766	16696	-3144.5	13354.5	-3523	10013	-3317	7972	-3111	5931	-3559.5	5150.5
S4	-4914	16696	-4844	13354.5	-4774	10013	-4643.5	7972	-4513	5931	-4355.5	5150.5
S5	-6966	0	-7079	0	-7192	0	-7188	0	-7184	0	-7481	0
S6	5255	15015	4972	11844.5	4689	8674	4619	6596	4549	4518	4263.5	3812
S7	8595	12239	7891	9312	7187	6385	6680.5	4726	6174	3067	5668	2556
S8	10414	8367	9501.5	5955	8589	3543	7741	2517	6893	1491	6235.5	1197.5
S9	11180	0	10167	0	9154	0	8134	0	7114	0	6399	0

	FOX VTR 180 L 6.5/11		FOX VTR 200 L 6.5/11		FOX VTR 220 L 6.5/11		FOX VTR 240 L 6.5/11		FOX VTR 260 L 6.5/11		FOX VTR 280 L 6.5/11		FOX VTR 300 L 6.5/11	
	Wind Load	Dead Load	Wind Load	Dead Load	Wind Load	Dead Load	Wind Load	Dead Load	Wind Load	Dead Load	Wind Load	Dead Load	Wind Load	Dead Load
S1	0	4142	0	3681	0	3220	0	2972	0	2724	0	2434	0	2144
S2	-3574	4370	-4194.5	4002.5	-4815	3635	-5393	3359	-5971	3083	-6610	2860.5	-7249	2638
S3	-4008	4370	-5131.5	4002.5	-6255	3635	-7769.5	3359	-9284	3083	-8746	2860.5	-8208	2638
S4	-4198	4370	-5226.5	4002.5	-6255	3635	-7769.5	3359	-9284	3083	-8746	2850	-8208	2617
S5	-7778	0	-8133.5	0	-8489	0	-8886.5	0	-9284	0	-8746	0	-8208	0
S6	3978	3106	3643.5	2619.5	3309	2133	3070	1908.5	2831	1684	2540	1481.5	2249	1279
S7	5162	2045	4630.5	1694.5	4099	1344	3724.5	1141.5	3350	939	2980	838.5	2610	738
S8	5578	904	4956.5	856	4335	808	3917	632.5	3499	457	3105.5	408	2712	359
S9	5684	0	5047	0	4410	0	3973.5	0	3537	0	3137.5	0	2738	0

Values are incl. safety factors, for dead load is 1.35 and for wind load is 1.50.

This is an interactive page! Click on the move-back button to jump back to the CONTENT AND OVERVIEW.