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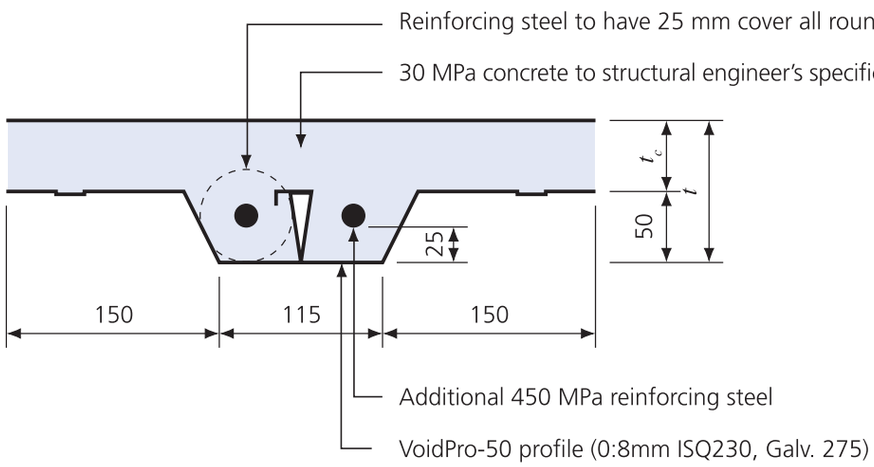
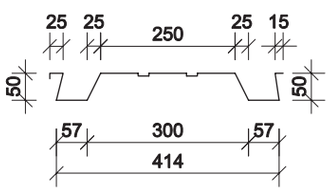
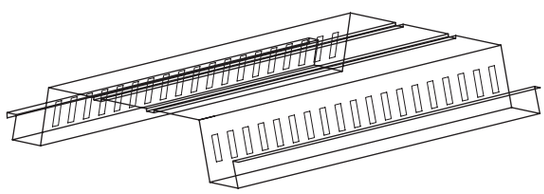
The VoidPro-50 profile displaces 0:0344 m^3 concrete per m^2 floor area. When calculating additional reinforcing requirements, it was assumed that the VoidPro-50 profile has an effective tension steel area of 292 mm^2.

Cross section through a typical VoidPro-50 T-beam



VoidPro-50: Front elevation and 3D view





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VOIDPRO-50 LOAD-SPAN TABLE

Additional reinforcing steel in [mm²] per beam at 415 mm spacing, for the VoidPro-50 system used in a single span simply supported configuration. Calculations are based on a characteristic concrete cube strength of 30 MPa and a characteristic deck steel yield strength of 230 MPa. Additional reinforcing should be high strength steel with a yield stress of 450 MPa. Additional reinforcing steel is limited to a maximum diameter of 20 mm. Cover of 25 mm above the deck soffit should be provided in all cases. Where values are listed as zero, no additional reinforcing is required as the VoidPro-50 profile provides sufficient tensile reinforcing. Where no value is listed, the span length is governed by either deflection considerations or the depth of the concrete compression block exceeds the limits imposed to prevent failure by concrete crushing. Underlined-values are for cases where serviceability considerations govern, but the allowable span can be increased by providing the indicated amount of reinforcing steel.

Reinforcing requirements for ultimate and serviceability limit states

Q_n[a]	G_n[b]	TL_f[c]	t[d]	Floor span in [m]									
[kPa]	[kPa]	[kPa]	[mm]	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75
				Additional reinforcing steel in [mm²] per beam 415 mm $^{c}/_{c}$									
1.50	2.065	5.96	120	0	0	0	0	0	0				
2.00	2.065	6.76	120	0	0	0	0	0					
2.50	2.065	7.56	120	0	0	0	0	0					
3.00	2.065	8.36	120	0	0	0	0	0					
4.00	2.065	9.96	120	0	0	0	0						
5.00	2.065	11.56	120	0	0	0							
7.50	2.065	15.56	120	0	20								
1.50	2.411	6.37	135	0	0	0	0	0	0	0	0		
2.00	2.411	7.17	135	0	0	0	0	0	0	0			
2.50	2.411	7.97	135	0	0	0	0	0	0	10			
3.00	2.411	8.77	135	0	0	0	0	0	0				
4.00	2.411	10.37	135	0	0	0	0	10	30				
5.00	2.411	11.97	135	0	0	0	10	30					
7.50	2.411	15.97	135	0	0	30	70						
1.50	2.756	6.79	150	0	0	0	0	0	0	0	0	0	410
2.00	2.756	7.59	150	0	0	0	0	0	0	0	0	20	
2.50	2.756	8.39	150	0	0	0	0	0	0	0	20	440	
3.00	2.756	9.19	150	0	0	0	0	0	0	10	30		
4.00	2.756	10.79	150	0	0	0	0	0	20	40			
5.00	2.756	12.39	150	0	0	0	0	20	40	210			
7.50	2.756	16.39	150	0	0	10	40	80	440				
1.50	2.987	7.06	160	0	0	0	0	0	0	0	0	0	10
2.00	2.987	7.86	160	0	0	0	0	0	0	0	0	10	30
2.50	2.987	8.66	160	0	0	0	0	0	0	0	10	30	240
3.00	2.987	9.46	160	0	0	0	0	0	0	0	20	50	
4.00	2.987	11.06	160	0	0	0	0	0	10	30	50	450	
5.00	2.987	12.66	160	0	0	0	0	10	30	60	150		
7.50	2.987	16.66	160	0	0	0	30	60	90	390			

[a] Unfactored imposed (live) load.
[b] Unfactored own-weight of the slab and the VoidPro-50 profile.
[c] Total factored load using the SANS10160-1 STR load combination of 1:2Gn + 1:6Qn where Gn is the total nominal permanent (dead) load and Qn is the total imposed (live) load. Note that in calculating the total factored load, an allowance was made for the additional permanent load of 0:9 kPa accounting for services and finishes. Concrete own weight was calculated based on a mass of 2350 kg/m³.
[d] Total thickness of the slab.

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REINFORCING REQUIREMENTS FOR A 60 MINUTE FIRE RATING

Additional reinforcing steel in [mm²] per beam at 415 mm spacing, for the VoidPro-50 system used in a single span simply supported configuration. The minimum slab thickness required to attain a 60 minute fire rating is 120 mm. Those values with * next to them are governed by fire requirements, whilst the remainder are governed by serviceability or ultimate limit state requirements. The steel decking has been assumed to lose all its strength in fire. Additional reinforcing steel is limited to a maximum diameter of 20 mm. Cover of 25 mm above the deck soffit should be provided in all cases. Refer to Table 1.1 for additional design assumptions. The reinforcement is suitable for the following occupancies according to SANS 10160-1: (A) Domestic and residential areas, (B) Public areas not susceptible to crowding, (C) Public areas where people may congregate, (D) Shopping areas, and (J/K) Accessible flat roofs. For other occupancy categories (industrial usage, storage etc.) refer to the Voidcon fire design guideline document.

Reinforcing requirements for a 60 minute fire rating

Q_n [a]	G_n [b]	TL_f [c]	t [d]	Floor span in [m]									
[kPa]	[kPa]	[kPa]	[mm]	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75
				Additional reinforcing steel in [mm²] per beam 415 mm $^{c}/_{c}$									
1.50	2.065	3.42	120	*37	*44	*53	*62	*72	*83				
2.00	2.065	3.57	120	*38	*46	*55	*65	*75					
2.50	2.065	3.72	120	*40	*48	*58	*68	*79					
3.00	2.065	3.87	120	*41	*50	*60	*70	*82					
4.00	2.065	4.17	120	*45	*54	*65	*76						
5.00	2.065	4.47	120	*48	*58	*69							
7.50	2.065	5.22	120	*56	*68								
1.50	2.411	3.76	135	*34	*42	*50	*58	*68	*78	*89	*100		
2.00	2.411	3.91	135	*36	*43	*52	*61	*70	*81	*92			
2.50	2.411	4.06	135	*37	*45	*54	*63	*73	*84	*96			
3.00	2.411	4.21	135	*38	*47	*56	*65	*76	*87				
4.00	2.411	4.51	135	*41	*50	*60	*70	*81	*94				
5.00	2.411	4.81	135	*44	*53	*64	*75	*87					
7.50	2.411	5.56	135	*51	*62	*74	*87						
1.50	2.756	4.11	150	*33	*39	*47	*55	*64	*74	*84	*95	*107	410
2.00	2.756	4.26	150	*34	*41	*49	*57	*67	*77	*87	*99	*111	
2.50	2.756	4.41	150	*35	*42	*51	*59	*69	*79	*90	*102	440	
3.00	2.756	4.56	150	*36	*44	*52	*61	*71	*82	*94	*106		
4.00	2.756	4.86	150	*39	*47	*56	*66	*76	*88	*100			
5.00	2.756	5.16	150	*41	*50	*59	*70	*81	*93	210			
7.50	2.756	5.91	150	*47	*57	*68	*80	*93	440				
1.50	2.987	4.34	160	*32	*38	*46	*54	*62	*72	*82	*93	*104	*116
2.00	2.987	4.49	160	*33	*40	*47	*56	*65	*74	*85	*96	*108	*120
2.50	2.987	4.64	160	*34	*41	*49	*58	*67	*77	*88	*99	*111	240
3.00	2.987	4.79	160	*35	*42	*51	*59	*69	*79	*90	*102	*115	
4.00	2.987	5.09	160	*37	*45	*54	*63	*73	*84	*96	*109	450	
5.00	2.987	5.39	160	*39	*48	*57	*67	*78	*89	*102	150		
7.50	2.987	6.14	160	*45	*54	*65	*76	*89	*102	390			

[a] Unfactored imposed (live) load.
[b] Unfactored own-weight of the slab and the VoidPro-50 profile.
[c] Total factored load using the SANS10160-1 ACC load combination of $1{:}0G_n + 0{:}3Q_n$ where G_n is the total nominal permanent (dead) load and Q_n is the total imposed (live) load. Note that in calculating the total factored load, an allowance was made for the additional permanent load of 0·9 kPa accounting for services and finishes.
[d] Total thickness of the slab.