

## APPENDIX D

### D.1 Macalloy Bars

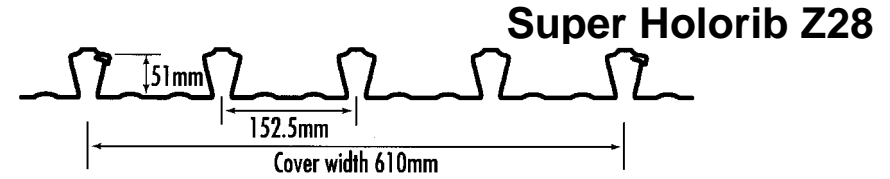
Bar dia. mm	Stressing ties	Stainless steel stressing ties	Stainless steel architectural ties	High strength precision ties	Tie rods grades		
					43	50	17m
18			79	80	36	49	58
20		147					
22					52	71	83
24			92	153			
25	241	232					
26.5	270						
27			112	187	82	114	132
30			138	230			
32	394	379					
36	500		195	322	144	198	229
40	618	591					
45					219	303	351
50	959						
60					398	525	636
72					574	758	918
75	2056						
90					709	1022	
100					892	1286	

Approximate safe working loads (kN)

D.2 Composite decking [Richard Lees Ltd.]

Load Span Table - Normal Weight Concrete

SUPPORT CONDITION	SLAB DEPTH mm	0.9mm GAUGE IMPOSED LOAD (kN/m <sup>2</sup> )				1.0MM GAUGE IMPOSED LOAD (kN/m <sup>2</sup> )				1.2mm GAUGE IMPOSED LOAD (kN/m <sup>2</sup> )			
		*	5.0	6.7	10.0	*	5.0	6.7	10.0	*	5.0	6.7	10.0
		Permanent	Temporary	Permanent	Temporary	Permanent	Temporary	Permanent	Temporary	Permanent	Temporary	Permanent	Temporary
SINGLE	100	2.55	2.55	2.55	2.55	2.79	2.79	2.79	2.79	3.09	3.09	3.09	3.09
	120	2.41	2.41	2.41	2.41	2.63	2.63	2.63	2.63	2.92	2.92	2.92	2.92
	130	2.35	2.35	2.35	2.35	2.57	2.57	2.57	2.57	2.85	2.85	2.85	2.85
	150	2.23	2.23	2.23	2.23	2.44	2.44	2.44	2.44	2.71	2.71	2.71	2.71
	175	2.12	2.12	2.12	2.12	2.31	2.31	2.31	2.31	2.57	2.57	2.57	2.57
	200	2.02	2.02	2.02	2.02	2.20	2.20	2.20	2.20	2.45	2.45	2.45	2.45
MULTIPLE	100	3.00	3.00	3.00	3.00	3.22	3.22	3.22	3.22	3.51	3.51	3.51	3.51
	120	2.82	2.82	2.82	2.82	3.07	3.07	3.07	3.07	3.35	3.35	3.35	3.35
	130	2.75	2.75	2.75	2.75	3.00	3.00	3.00	3.00	3.28	3.28	3.28	3.28
	150	2.61	2.61	2.61	2.61	2.85	2.85	2.85	2.85	3.14	3.14	3.14	3.14
	175	2.47	2.47	2.47	2.47	2.70	2.70	2.70	2.70	2.99	2.99	2.99	2.99
	200	2.35	2.35	2.35	2.35	2.56	2.56	2.56	2.56	2.84	2.84	2.84	2.84
PROPPED	100	3.55	3.55	3.55	3.17	3.55	3.55	3.55	3.34	3.55	3.55	3.55	3.44
	120	4.25	4.25	4.16	3.50	4.25	4.25	4.25	3.68	4.25	4.25	4.25	4.01
	130	4.60	4.60	4.33	3.65	4.60	4.60	4.53	3.83	4.60	4.60	4.60	4.18
	150	5.30	5.18	4.63	3.92	5.30	5.30	4.83	4.11	5.30	5.30	5.22	4.47
	175	5.04	5.04	4.96	4.23	5.44	5.44	5.17	4.42	5.95	5.95	5.56	4.79
	200	4.82	4.82	4.82	4.50	5.20	5.20	5.20	4.70	5.69	5.69	5.69	5.08



- Notes (On tables to left)
- \*depicts maximum spans when deck used as permanent shuttering only.
  - The spans indicated assume clear span + 100mm to the centreline of supports.
  - A span to depth ratio of 35:1 for normal weight and 30:1 for lightweight concrete is imposed in deriving the above spans.
  - For calculating deflections an additional loading of 0.5 kN/m<sup>2</sup> is included by RLSD Ltd to allow for non-recoverable deflection due to construction personnel. Maximum deflections are limited to span/130 after taking account of ponding.
  - All other construction stage design checks include an allowance of 1.5 kN/m<sup>2</sup> for construction loading.
  - Tables are based on grade C30 concrete of wet density 2,400 kg/m<sup>3</sup> and 1900 kg/m<sup>3</sup> for lightweight.
  - The dead weight of the slab has been included in the development of the spans shown. However, consideration should be given to finishes, partition walls, etc when reading from these tables.
  - Composite slabs are designed as simply supported irrespective of the deck support configuration. A nominal crack control mesh is required over the supports in accordance with clause 6.7, 6.8 and 6.9 of BS 5950:Part 4.
  - Decking is manufactured from material meeting the following specification: BS EN 10147 designated in accordance with BS EN 10025 S280 GD + Z275 NA-C.

Simplified Fire Design Method - Continuous spans only

FIRE RATING hrs	SLAB DEPTH mm	NORMAL WEIGHT CONCRETE SPAN (m) FOR GIVEN IMPOSED LOAD (kN/m <sup>2</sup> )									LIGHTWEIGHT CONCRETE SPAN (m) FOR GIVEN IMPOSED LOAD (kN/m <sup>2</sup> )								
		A142			A193			A252			A142			A193			A252		
		5.0	6.7	10.0	5.0	6.7	10.0	5.0	6.7	10.0	5.0	6.7	10.0	5.0	6.7	10.0	5.0	6.7	10.0
1.0	100	2.78	2.50	2.14	2.78	2.50	2.14	2.78	2.50	2.14	2.79	2.50	2.12	2.79	2.50	2.12	2.79	2.50	2.12
	120	3.31	3.00	2.58	3.31	3.00	2.58	3.31	3.00	2.58	3.43	3.08	2.63	3.60	3.07	2.60	3.60	3.07	2.60
	130	3.38	3.07	2.64	4.01	3.64	3.14	4.01	3.64	3.14	3.50	3.16	2.70	3.90	3.69	3.15	3.90	3.69	3.15
	150	3.49	3.19	2.76	4.10	3.78	3.28	4.10	3.78	3.28	3.50	3.30	2.84	4.10	3.85	3.31	4.10	3.85	3.31
	175	-	-	-	4.10	3.94	3.44	4.10	3.94	3.44	-	-	-	4.10	4.02	3.48	4.10	4.02	3.48
	200	-	-	-	4.10	4.08	3.58	4.10	4.08	3.58	-	-	-	4.10	4.02	3.63	4.10	4.10	3.63
1.5	105	-	-	-	-	-	-	-	-	-	2.79	2.50	2.12	2.79	2.50	2.12	2.79	2.50	2.12
	110	2.77	2.50	2.14	2.77	2.50	2.14	2.77	2.50	2.14	2.83	2.54	2.16	2.83	2.54	2.16	2.83	2.54	2.16
	130	3.30	3.00	2.59	3.30	3.00	2.59	3.30	3.00	2.59	3.41	3.07	2.63	3.90	3.64	3.12	3.90	3.64	3.12
	150	3.42	3.12	2.71	4.06	3.71	3.22	4.06	3.71	3.22	3.50	3.20	2.76	4.10	3.80	3.27	4.10	3.80	3.27
	175	-	-	-	4.10	3.86	3.38	4.10	3.86	3.38	-	-	-	4.10	3.98	3.44	4.10	3.98	3.44
	200	-	-	-	4.10	4.00	3.52	4.10	4.00	3.52	-	-	-	4.10	4.10	3.59	4.10	4.10	3.59
2.0	130	-	-	-	-	-	-	-	-	-	-	-	-	3.33	3.00	2.57	3.90	3.60	3.08
	140	-	-	-	3.30	3.00	2.59	3.30	3.00	2.59	-	-	-	3.40	3.07	2.63	4.08	3.68	3.16
	150	-	-	-	3.35	3.06	2.65	3.98	3.63	3.15	-	-	-	3.46	3.13	2.69	4.10	3.76	3.23
	175	-	-	-	3.48	3.19	2.79	4.10	3.79	3.31	-	-	-	3.50	3.28	2.84	4.10	3.93	3.40
	200	-	-	-	3.50	3.30	2.90	4.10	3.93	3.45	-	-	-	3.50	3.41	2.96	4.10	4.09	3.56

- Notes (on table above)
- The simplified fire design method is based on fire tests on composite slabs incorporating steel meshes with 15-45mm top cover. This method is applicable for any construction where the mesh may act in tension over a supporting beam or wall (negative bending). This includes all end bay conditions.
  - All figures in the table are derived strictly in accordance with guidance given in SCI publication 056-'The fire resistance of composite floors with steel decking' (2<sup>nd</sup> edition), 1991.
  - Loads shown here are unfactored working loads and should include all imposed dead and live loads, excluding only the self weight of the slab. An ultimate load factor of 1.0 is assumed throughout.]
  - The mesh should satisfy the minimum elongation requirement given in BS4449 : 1998.
  - For conditions outside the scope of these tables , including all isolated spans, consult the appropriate fire engineering chart.

Composite Decking cont. [Ward Multideck 60 – Normal weight concrete]

LIGHTWEIGHT CONCRETE			MAXIMUM PERMISSIBLE SPAN (m)																							
Span Type (Support Condition)	Slab Depth (mm)	Min Mesh Size	t = 0.9 Total Applied Load (kN/m <sup>2</sup> ) (See note 6)						t = 1.0 Total Applied Load (kN/m <sup>2</sup> ) (See note 6)						t = 1.1 Total Applied Load (kN/m <sup>2</sup> ) (See note 6)						t = 1.2 Total Applied Load (kN/m <sup>2</sup> ) (See note 6)					
			4.0	6.0	8.0	10.0	12.0	14.0	4.0	6.0	8.0	10.0	12.0	14.0	4.0	6.0	8.0	10.0	12.0	14.0	4.0	6.0	8.0	10.0	12.0	14.0
	120	A98	2.48	2.48	2.48	2.48	2.48	2.39	3.01	3.01	3.01	3.01	2.81	2.54	3.36	3.36	3.36	3.31	2.93	2.65	3.50	3.50	3.50	3.32	2.94	2.65
	130	A142	2.40	2.40	2.40	2.40	2.40	2.90	2.90	2.90	2.90	2.90	2.73	3.26	3.26	3.26	3.26	3.16	2.86	3.40	3.40	3.40	3.40	3.15	2.85	
	140	A142	2.32	2.32	2.32	2.32	2.32	2.80	2.80	2.80	2.80	2.80	2.80	3.17	3.17	3.17	3.17	3.17	3.05	3.31	3.31	3.31	3.31	3.31	3.05	
	150	A142	2.25	2.25	2.25	2.25	2.25	2.71	2.71	2.71	2.71	2.71	2.71	3.09	3.09	3.09	3.09	3.09	3.09	3.22	3.22	3.22	3.22	3.22	3.22	3.22
	160	A142	2.19	2.19	2.19	2.19	2.19	2.19	2.63	2.63	2.63	2.63	2.63	3.01	3.01	3.01	3.01	3.01	3.01	3.14	3.14	3.14	3.14	3.14	3.14	3.14
	175	A193	2.10	2.10	2.10	2.10	2.10	2.10	2.53	2.53	2.53	2.53	2.53	2.89	2.89	2.89	2.89	2.89	2.89	3.03	3.03	3.03	3.03	3.03	3.03	3.03
	200	A193	1.98	1.98	1.98	1.98	1.98	1.98	2.37	2.37	2.37	2.37	2.37	2.71	2.71	2.71	2.71	2.71	2.71	2.85	2.85	2.85	2.85	2.85	2.85	2.85
	250	A252	1.79	1.79	1.79	1.79	1.79	2.14	2.14	2.14	2.14	2.14	2.14	2.44	2.44	2.44	2.44	2.44	2.56	2.56	2.56	2.56	2.56	2.56	2.56	
	120	A98	2.88	2.88	2.88	2.85	2.65	2.39	3.31	3.31	3.31	3.15	2.80	2.53	3.66	3.66	3.63	3.31	2.93	2.65	3.82	3.82	3.77	3.32	2.94	2.65
	130	A142	2.78	2.78	2.78	2.78	2.78	2.58	3.22	3.22	3.22	3.22	3.03	2.72	3.55	3.55	3.55	3.51	3.16	2.86	3.71	3.71	3.71	3.57	3.15	2.85
	140	A142	2.68	2.68	2.68	2.68	2.68	3.13	3.13	3.13	3.13	3.13	2.92	3.45	3.45	3.45	3.45	3.45	3.38	3.05	3.60	3.60	3.60	3.60	3.38	3.05
	150	A142	2.60	2.60	2.60	2.60	2.60	3.05	3.05	3.05	3.05	3.05	3.05	3.36	3.36	3.36	3.36	3.36	3.36	3.23	3.51	3.51	3.51	3.51	3.51	3.24
	160	A142	2.52	2.52	2.52	2.52	2.52	2.96	2.96	2.96	2.96	2.96	2.96	3.28	3.28	3.28	3.28	3.28	3.28	3.28	3.42	3.42	3.42	3.42	3.42	3.42
	175	A193	2.42	2.42	2.42	2.42	2.42	2.84	2.84	2.84	2.84	2.84	2.84	3.16	3.16	3.16	3.16	3.16	3.16	3.16	3.30	3.30	3.30	3.30	3.30	3.30
	200	A193	2.28	2.28	2.28	2.28	2.28	2.67	2.67	2.67	2.67	2.67	2.67	3.00	3.00	3.00	3.00	3.00	3.00	3.13	3.13	3.13	3.13	3.13	3.13	3.13
	250	A252	2.06	2.06	2.06	2.06	2.06	2.40	2.40	2.40	2.40	2.40	2.40	2.69	2.69	2.69	2.69	2.69	2.83	2.83	2.83	2.83	2.83	2.83	2.83	

LIGHTWEIGHT CONCRETE PROPPED			MAXIMUM PERMISSIBLE SPAN (m)																							
Span Type (Support Condition)	Slab Depth (mm)	Min Mesh Size	t = 0.9 Total Applied Load (kN/m <sup>2</sup> ) (See note 6)						t = 1.0 Total Applied Load (kN/m <sup>2</sup> ) (See note 6)						t = 1.1 Total Applied Load (kN/m <sup>2</sup> ) (See note 6)						t = 1.2 Total Applied Load (kN/m <sup>2</sup> ) (See note 6)					
			4.0	6.0	8.0	10.0	12.0	14.0	4.0	6.0	8.0	10.0	12.0	14.0	4.0	6.0	8.0	10.0	12.0	14.0	4.0	6.0	8.0	10.0	12.0	14.0
	120	A98	4.19	3.54	3.03	*	*	*	4.20	3.75	*	*	*	*	4.20	3.91	*	*	*	*	4.20	3.91	*	*	*	*
	130	A142	4.42	3.78	3.23	*	*	*	4.55	3.99	3.42	*	*	*	4.55	4.15	3.56	*	*	*	4.55	4.15	*	*	*	*
	140	A142	4.61	4.00	3.43	*	*	*	4.90	4.21	3.62	3.20	*	*	4.90	4.37	3.76	3.33	*	*	4.90	4.37	3.76	*	*	*
	150	A142	4.78	4.18	3.62	3.20	2.89	*	5.09	4.40	3.80	3.37	*	*	5.25	4.50	3.95	3.57	*	*	5.25	4.58	3.95	*	*	*
	160	A142	4.94	4.33	3.79	3.36	3.04	*	5.25	4.61	3.98	3.53	3.19	*	5.53	4.78	4.13	3.67	3.32	*	5.60	4.78	4.13	3.67	*	*
	175	A193	4.79	4.53	4.04	3.59	3.25	2.98	5.47	4.82	4.23	3.76	3.41	3.13	5.76	5.06	4.39	3.90	3.54	*	5.98	5.06	4.38	3.90	3.54	3.25
	200	A193	4.56	4.56	4.40	3.94	3.57	3.27	5.34	5.14	4.61	4.11	3.37	343	6.00	5.40	4.77	4.26	3.87	3.56	6.26	5.47	4.77	4.26	3.87	3.56
	250	A252	4.12	4.12	4.12	4.12	4.12	3.81	4.80	4.80	4.80	4.73	4.31	3.97	5.38	5.38	5.38	4.88	4.45	4.11	5.66	5.66	5.42	4.88	4.45	4.11
	200	A193	5.45	4.83	4.40	3.93	3.55	3.27	5.79	*	*	*	*	*	6.07	*	*	*	*	*	6.32	*	*	*	*	*
	250	A252	5.91	5.30	4.87	4.52	*	*	6.27	5.63	5.15	*	*	*	6.58	5.92	5.42	*	*	*	6.86	6.16	*	*	*	*

- Notes:**
- All tabulated figures include the self weight of the slab.
  - All tabulated figures include a construction allowance of 1.5kN/m<sup>2</sup> for spans of 3m and over, or 4.5/span kN/m<sup>2</sup> for spans less than 3m in accordance with the recommendations of BS 5950: Part 4 1994.
  - The suggested maximum ratios of slab span to slab depth are 30 for LWC and 35 for NWC to control deflections. Deflection under construction loading (wet concrete etc.)
  - Minimum reinforcement mesh sizes provide 0.1% of the gross cross-sectional areas of the concrete at the support.
  - The composite slabs should meet the requirements of BS 5950: Part 4 1994 with regard to their composite behaviour under normal imposed loads.
  - Total applied load referred to in the above table is a working load based on factored combinations of live loads, finishes, ceilings, services and partitions, divided by a load factor of 1.60 (excluding slab self weight).
  - Temporary supports should remain in place until the concrete has achieved its 28 day cub strength.
  - \* The addition of props gives no further benefit in these cases.
  - Propped loads assume props are equally spaced.
  - Deck must lie flat on all support beams. Point only contact will affect design loading.



Composite Decking cont. [Ward Multideck 60 - Lightweight concrete]

LIGHTWEIGHT CONCRETE			MAXIMUM PERMISSIBLE SPAN (m)																											
Span Type (Support Condition)	Slab Depth (mm)	Min Mesh Size	t = 0.9 Total Applied Load (kN/m <sup>2</sup> ) (See note 6)								t = 1.0 Total Applied Load (kN/m <sup>2</sup> ) (See note 6)				t = 1.1 Total Applied Load (kN/m <sup>2</sup> ) (See note 6)								t = 1.2 Total Applied Load (kN/m <sup>2</sup> ) (See note 6)							
			4.0	6.0	8.0	10.0	12.0	14.0	4.0	6.0	8.0	10.0	12.0	14.0	4.0	6.0	8.0	10.0	12.0	14.0	4.0	6.0	8.0	10.0	12.0	14.0				
				120	A98	2.67	2.67	2.67	2.39	2.65	2.39	3.19	3.19	3.19	3.17	2.81	2.54	3.55	3.55	3.55	3.32	2.94	2.66	3.71	3.60	3.60	3.32	2.94	2.65	
130	A142	2.58		2.58	2.58	2.58	2.58	2.58	3.10	3.10	3.10	3.10	3.03	2.73	3.44	3.44	3.44	3.44	3.16	2.86	3.61	3.61	3.61	3.57	3.16	2.86				
140	A142	2.50		2.50	2.50	2.50	2.50	2.50	3.03	3.03	3.03	3.03	3.03	2.92	3.38	3.38	3.38	3.38	3.38	3.05	3.52	3.52	3.52	3.52	3.38	3.05				
150	A142	2.43		2.43	2.43	2.43	2.43	2.43	2.95	2.95	2.95	2.95	2.95	2.95	3.30	3.30	3.30	3.30	3.30	3.24	3.44	3.44	3.44	3.44	3.44	3.24				
160	A142	2.37		2.37	2.37	2.37	2.37	2.37	2.86	2.86	2.86	2.86	2.86	2.86	3.22	3.22	3.22	3.22	3.22	3.22	3.22	3.36	3.36	3.36	3.36	3.36	3.36			
175	A193	2.28		2.28	2.28	2.28	2.28	2.28	2.28	2.75	2.75	2.75	2.75	2.75	3.12	3.12	3.12	3.12	3.12	3.12	3.12	3.26	3.26	3.26	3.26	3.26	3.26			
200	A193	2.15		2.15	2.15	2.15	2.15	2.15	2.59	2.59	2.59	2.59	2.59	2.59	2.97	2.97	2.97	2.97	2.97	2.97	2.97	3.10	3.10	3.10	3.10	3.10	3.10			
250	A252	1.79	1.96	1.96	1.96	1.96	1.96	2.35	2.35	2.35	2.35	2.35	2.35	2.72	2.72	2.72	2.72	2.72	2.72	2.82	2.82	2.82	2.82	2.82	2.82	2.82				
	120	A98	3.08	3.08	3.08	2.39	2.65	2.39	3.51	3.51	3.51	3.17	2.81	2.54	3.87	3.60	3.60	3.30	2.94	2.66	3.97	3.60	3.60	3.32	2.94	2.65				
	130	A142	3.00	3.00	3.00	2.58	2.85	2.58	3.42	3.42	3.42	3.40	3.03	2.72	3.77	3.77	3.77	3.57	3.16	2.86	3.94	3.94	3.94	3.57	3.16	2.86				
	140	A142	2.91	2.9	2.91	2.77	2.91	2.77	3.33	3.33	3.33	3.33	3.24	2.92	3.68	3.68	3.68	3.68	3.68	3.05	3.84	3.84	3.84	3.84	3.38	3.05				
	150	A142	2.82	2.82	2.82	2.82	2.82	2.82	3.25	3.25	3.25	3.25	3.25	3.11	3.59	3.59	3.59	3.59	3.59	3.59	3.24	3.75	3.75	3.75	3.75	3.75	3.24			
	160	A142	2.74	2.74	2.74	2.74	2.74	2.74	3.18	3.18	3.18	3.18	3.18	3.18	3.51	3.51	3.51	3.51	3.51	3.51	3.43	3.67	3.67	3.67	3.67	3.67	3.43			
	175	A193	2.63	2.63	2.63	2.63	2.63	2.63	3.08	3.08	3.08	3.08	3.08	3.08	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.55	3.55	3.55	3.55	3.55	3.55			
	200	A193	2.48	2.48	2.48	2.48	2.48	2.48	2.92	2.92	2.92	2.92	2.92	2.92	3.23	3.23	3.23	3.23	3.23	3.23	3.38	3.38	3.38	3.38	3.38	3.38	3.38			
250	A252	2.25	2.25	2.25	2.25	2.25	2.25	2.63	2.63	2.63	2.63	2.63	2.63	2.96	2.96	2.96	2.96	2.96	2.96	2.96	3.10	3.10	3.10	3.10	3.10	3.10				

LIGHTWEIGHT CONCRETE PROPPED			MAXIMUM PERMISSIBLE SPAN (m)																											
Span Type (Support Condition)	Slab Depth (mm)	Min Mesh Size	t = 0.9 Total Applied Load (kN/m <sup>2</sup> ) (See note 6)								t = 1.0 Total Applied Load (kN/m <sup>2</sup> ) (See note 6)				t = 1.1 Total Applied Load (kN/m <sup>2</sup> ) (See note 6)								t = 1.2 Total Applied Load (kN/m <sup>2</sup> ) (See note 6)							
			4.0	6.0	8.0	10.0	12.0	14.0	4.0	6.0	8.0	10.0	12.0	14.0	4.0	6.0	8.0	10.0	12.0	14.0	4.0	6.0	8.0	10.0	12.0	14.0				
				120	A98	3.66	*	*	*	*	*	3.79	3.60	*	*	*	*	3.90	*	*	*	*	*	3.95	*	*	*	*	*	
130	A142	3.92		3.89	*	*	*	*	4.05	3.90	3.53	*	*	*	4.15	3.90	3.66	*	*	*	4.21	3.90	*	*	*	*				
140	A142	4.20		4.13	3.55	*	*	*	4.31	4.20	3.74	3.33	*	*	4.41	4.20	3.88	3.43	*	*	4.47	4.20	*	*	*	*				
150	A142	4.50		4.32	3.76	3.30	*	*	4.56	4.47	3.95	3.47	*	*	4.67	4.50	4.10	3.61	*	*	4.73	4.50	4.10	*	*	*				
160	A142	4.94		4.80	4.48	3.95	3.48	*	4.81	4.77	4.14	3.65	3.29	*	4.92	4.80	4.30	3.79	*	*	4.98	4.80	4.30	3.79	*	*				
175	A193	5.25		4.71	4.23	3.72	3.35	*	5.25	5.01	4.42	3.90	3.51	3.21	5.28	5.25	4.58	4.04	3.65	3.34	5.35	5.24	4.57	4.03	3.63	*				
200	A193	4.95		4.95	4.55	4.11	3.70	3.38	5.84	5.31	4.82	4.29	3.87	3.54	5.98	5.63	5.01	4.44	4.01	3.67	6.00	5.82	5.01	4.43	4.01	3.67				
250	A252	4.50	4.50	4.50	4.50	4.20	3.71	-	-	-	-	-	-	5.92	5.92	5.66	5.14	4.52	4.00	6.20	6.20	5.76	5.12	4.65	4.11					
	200	A193	5.76	5.05	*	*	*	*	6.00	5.36	4.83	4.28	3.87	3.54	6.00	*	*	*	*	*	*	*	*	*	*	*				
	250	A252	6.30	5.59	5.06	4.68	*	*	6.51	5.93	5.38	4.97	4.37	3.87	7.02	6.23	5.65	*	*	*	7.32	6.50	*	*	*	*				

NOTES

- All tabulated figures include the self weight of the slab.
- All tabulated figures include a construction allowance of 1.5kN/m<sup>2</sup> for spans of 3m and over, or 4.5kN/m<sup>2</sup> for spans less than 3m in accordance with the recommendations of BS5950: Part 4 1994.
- The suggested maximum ratios of slab span to slab depth are 30 for

LWC and 35 for NWC to control deflection. Deflection under construction loading (wet concrete etc.) has been limited to that stipulated in BS5950: Part 4 1994. For purpose of calculating the span /depth ratio, the distance between the centre-lines of the supports of an end span may be used.

- Minimum reinforcement mesh sizes provide 0.1% of the gross cross-sectional area of the concrete at the support.
- The composite slabs should meet the requirements of BS 5950: Part 4 1994 with regard to their composite behaviour under normal imposed loads.
- Total applied load referred to in the above table is a working load based on factored combinations of live loads, ceilings, finished, services and partitions, divided by a load factor of 1.60 (excluding slab self weight).

- Temporary supports should remain in place until the concrete has achieved its 28 day cube strength.
- \* The addition of props gives no further benefit in these cases.
- Propped loads assume props are equally spaced.
- Deck must lie flat on all support beams. Point only contact will affect design loading.

Composite Decking cont. [Ward Multideck 60 - Fire resistance]

NORMALE WEIGHT CONCRETE		MAXIMUM PERMISSIBLE SPAN (m)																			
Slab Depth (mm)	Min Mesh Size	Fire rating: 1.0 hour(s)					Fire rating: 1.5 hour(s)					Fire rating: 2.0 hour(s) – end span					Fire rating: 2.0 hour(s) – internal span				
		Total Applied Load (kN/m <sup>2</sup> ) See note 6 (page 8)					Total Applied Load (kN/m <sup>2</sup> ) See note 6 (page 8)					Total Applied Load (kN/m <sup>2</sup> ) See note 6 (page 8)					Total Applied Load (kN/m <sup>2</sup> ) See note 6 (page 8)				
		4.00	6.00	8.00	10.00	12.00	4.00	6.00	8.00	10.00	12.00	4.00	6.00	8.00	10.00	12.00	4.00	6.00	8.00	10.00	12.00
130	142	3.85	3.43	3.15	2.92	2.73	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
130	193	4.18	3.74	3.41	3.16	2.96	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
130	252	4.51	4.03	3.68	3.41	3.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
140	142	4.01	3.60	3.30	3.06	2.87	3.63	3.25	2.98	2.77	2.60	-	-	-	-	-	-	-	-	-	-
140	193	4.36	3.91	3.58	3.32	3.12	3.95	3.54	3.25	3.02	2.83	-	-	-	-	-	-	-	-	-	-
140	252	4.71	4.23	3.87	3.59	3.37	4.28	3.84	3.51	3.26	3.06	-	-	-	-	-	-	-	-	-	-
150	142	4.06	3.67	3.37	3.14	2.95	3.78	3.40	3.13	2.91	2.73	3.13	2.82	2.59	2.41	2.27	3.73	3.36	3.09	2.87	2.70
150	193	4.44	3.99	3.66	3.41	3.20	4.13	3.72	3.41	3.17	2.98	3.48	3.14	2.88	2.68	2.52	4.16	3.75	3.44	3.20	3.01
150	252	4.80	4.32	3.97	3.69	3.46	4.47	4.02	3.69	3.43	3.22	3.85	3.47	3.18	2.96	2.78	4.60	4.14	3.80	3.53	3.31
160	142	4.13	3.73	3.43	3.20	3.00	3.89	3.52	3.23	3.01	2.83	3.26	2.95	3.72	2.53	2.38	3.95	3.56	3.28	3.06	2.87
160	193	4.49	4.05	3.72	3.47	3.26	4.26	3.85	3.54	3.29	3.10	3.65	3.30	3.03	2.83	2.66	4.42	3.99	3.67	3.42	3.21
160	252	4.86	4.39	4.03	3.75	3.53	4.62	4.17	3.83	3.57	3.36	4.03	3.64	3.35	3.12	2.93	4.87	4.40	4.04	3.75	3.54
175	142	4.19	3.80	3.51	3.27	3.08	3.95	3.58	3.31	3.09	2.91	3.38	3.07	2.83	2.65	2.49	4.15	3.76	3.47	3.24	3.05
175	193	4.55	4.13	3.81	3.55	3.35	4.33	3.92	3.62	3.38	3.18	3.78	3.43	3.17	2.96	2.79	4.66	4.22	3.90	3.64	3.43
175	252	4.93	4.47	4.12	3.84	3.62	4.69	4.25	3.92	3.65	3.45	4.19	3.80	3.50	3.27	3.08	5.15	4.67	4.31	4.02	3.78
200	*142	4.29	3.92	3.63	3.40	3.21	4.04	3.69	3.42	3.21	3.03	3.45	3.15	2.92	2.74	2.59	4.31	3.94	3.65	3.42	3.23
200	193	4.65	4.25	3.94	3.69	3.48	4.42	4.03	3.74	3.50	3.31	3.86	3.53	3.27	3.06	2.89	4.86	4.44	4.11	3.85	3.64
200	252	5.03	4.59	4.25	3.98	3.76	4.79	4.38	4.05	3.80	3.58	4.28	3.90	3.62	3.39	3.20	5.40	4.93	4.56	4.27	4.03
250	*142	4.44	4.10	3.83	3.60	3.42	4.18	3.86	3.60	3.39	3.22	3.53	3.26	3.05	2.87	2.73	4.55	4.20	3.92	3.70	3.50
250	*193	4.81	4.43	4.14	3.90	3.70	4.56	4.21	3.93	3.70	3.51	3.96	3.66	3.41	3.22	3.05	5.15	4.75	4.44	4.18	3.96
250	252	5.19	4.79	4.47	4.21	3.99	4.95	4.56	4.26	4.01	3.80	4.39	4.05	3.78	3.56	3.38	5.74	5.30	4.94	4.65	4.41

LIGHTWEIGHT CONCRETE		MAXIMUM PERMISSIBLE SPAN (m)																			
Slab Depth (mm)	Min Mesh Size	Fire rating: 1.0 hour(s)					Fire rating: 1.5 hour(s)					Fire rating: 2.0 hour(s) – end span					Fire rating: 2.0 hour(s) – internal span				
		Total Applied Load (kN/m <sup>2</sup> ) See note 6 (page 8)					Total Applied Load (kN/m <sup>2</sup> ) See note 6 (page 8)					Total Applied Load (kN/m <sup>2</sup> ) See note 6 (page 8)					Total Applied Load (kN/m <sup>2</sup> ) See note 6 (page 8)				
		4.00	6.00	8.00	10.00	12.00	4.00	6.00	8.00	10.00	12.00	4.00	6.00	8.00	10.00	12.00	4.00	6.00	8.00	10.00	12.00
120	142	3.60	3.43	3.11	2.87	2.68	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
120	193	3.60	3.60	3.39	3.12	2.91	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
120	252	3.60	3.60	3.60	3.37	3.14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
130	142	3.90	3.63	3.30	3.04	2.84	3.63	3.22	2.92	2.70	2.52	-	-	-	-	-	-	-	-	-	-
130	193	3.90	3.90	3.60	3.32	3.10	3.90	3.54	3.22	2.97	2.77	-	-	-	-	-	-	-	-	-	-
130	252	3.90	3.90	3.89	3.59	3.35	3.90	3.87	3.52	3.25	3.03	-	-	-	-	-	-	-	-	-	-
140	142	4.20	3.77	3.43	3.17	2.97	3.83	3.40	3.10	2.86	2.68	3.39	3.01	2.74	2.54	2.38	4.09	3.63	3.31	3.06	2.86
140	193	4.20	4.12	3.75	3.46	3.24	4.20	3.75	3.42	3.16	2.96	3.80	3.38	3.07	2.84	2.66	4.20	4.08	3.72	3.43	3.21
140	252	4.20	4.20	4.07	3.76	3.51	4.20	4.11	3.74	3.46	3.23	4.20	3.73	3.40	3.14	2.94	4.20	4.20	4.11	3.80	3.55
150	142	4.31	3.84	3.50	3.24	3.04	3.93	3.50	3.19	2.96	2.77	3.56	3.17	2.90	2.68	2.51	4.35	3.87	3.53	3.27	3.06
150	193	4.50	4.19	3.82	3.54	3.31	4.35	3.88	3.53	3.27	3.06	4.00	3.56	3.25	3.01	2.82	4.50	4.37	3.98	3.68	3.45
150	252	4.50	4.50	4.14	3.83	3.59	4.50	4.25	3.88	3.59	3.36	4.43	3.95	3.60	3.34	3.12	4.50	4.50	4.42	4.09	3.82
160	142	4.37	3.91	3.57	3.31	3.10	3.97	3.56	3.25	3.01	2.82	3.63	3.25	2.97	2.76	2.58	4.48	4.01	3.66	3.39	3.18
160	193	4.76	4.26	3.89	3.60	3.38	4.40	3.93	3.59	3.33	3.12	4.09	3.66	3.34	3.10	2.90	4.80	4.53	4.14	3.83	3.59
160	252	4.80	4.62	4.22	3.91	3.66	4.80	4.31	3.94	3.65	3.42	4.53	4.05	3.70	3.43	3.21	4.80	4.80	4.59	4.25	3.96
175	*142	4.45	3.99	3.66	3.40	3.19	4.04	3.62	3.32	3.08	2.89	3.67	3.30	3.03	2.81	2.64	4.59	4.12	3.77	3.51	3.29
175	193	4.84	4.35	3.98	3.70	3.47	4.45	4.00	3.67	3.41	3.20	4.14	3.72	3.41	3.16	2.97	5.17	4.67	4.27	3.97	3.72
175	252	5.19	4.71	4.31	4.01	3.76	4.89	4.39	4.02	3.74	3.50	4.59	4.12	3.77	3.50	3.29	5.25	5.17	4.75	4.40	4.13
200	*142	4.57	4.13	3.80	3.54	3.33	4.13	3.73	3.44	3.20	3.01	3.74	3.39	3.12	2.91	2.73	4.76	4.30	3.96	3.68	3.46
200	193	4.97	4.49	4.13	3.85	3.61	4.56	4.12	3.79	3.53	3.32	4.21	3.81	3.50	3.27	3.07	5.40	4.87	4.48	4.17	3.92
200	252	5.38	4.86	4.47	4.16	3.91	5.00	4.52	4.15	3.87	3.64	4.67	4.22	3.88	3.62	3.40	5.00	5.43	4.99	4.64	4.36
250	*142	4.76	4.34	4.03	3.77	3.56	4.28	3.91	3.62	3.39	3.21	3.85	3.52	3.26	3.06	2.89	5.02	4.58	4.24	3.97	3.75
250	*193	5.16	4.71	4.37	4.09	3.86	4.72	4.31	3.99	3.74	3.53	4.33	3.95	3.66	3.43	3.24	5.70	5.21	4.82	4.51	4.26
250	252	5.58	5.10	4.72	4.42	4.17	5.17	4.72	4.37	4.09	3.86	4.80	4.38	4.06	3.80	3.59	6.37	5.81	5.38	5.04	4.75

Spans of 3.5m and over are based on 12mm deck only. For single span conditions use the Ward Multideck Software (see page 6) or contact Ward Technical Services.



D.3 Purlin Systems - Zed purlin sleeved system [Metsec]

Factor	Factor
1.40	1.40
1.00	1.00
1.20	1.20
1.60	1.60
1.20	1.20
1.40	1.40
1.20	1.20
1.20	1.20
1.05	1.05

Wind Assessment  
 With reference to BS 5950 - Part 5 : 1987 'Code of Practice for design of cold formed sections' please note the following:- (Clause 2.2.2). "In the case of purlins an sheeting rails, local wind pressure and suction need to be considered".

The load tables contained in this technical catalogue are based on the criteria shown below and are the results of a extensive design and testing programme completed by using the facilities and skills of the Department of Mechanic's of Materials at Strathelyde University.

Performance  
 The performance of the systems shown in the Technical Design Manual has been derived by calculation in accordance with BS 5950 Part 5, calibrated and proven by full scale tests. Purlin load tables are valid up to and including 25° roof slopes. For slopes greater than 25° use the Metspec Pulin computer design program.

SECTION REFEREN CE	WEIG HT kg/m	WORKING LOAD							DEFLECTION		ULTIMATE U.D.L. IN kN/SPAN				
		TOTAL U.D.L. kN	ALLOWABLE LOADNG in kN/m <sup>2</sup> PURLIN CENTRES in millimetres						SPAN 180	SPAN 360	DOWN LOAD	Uplift - Metal Cladding			
			1000	1200	1500	1800	2000	2400				Number of Anti Sags			
<b>SPAN 6.0m</b>													0	1	2
142.Z.16	3.60	6.14	1.02	0.85	0.68	0.57	0.51	0.43	6.35	3.18	13.09	8.31	13.09	13.09	
172.Z.14	3.60	8.29	1.38	1.15	0.92	0.77	0.69	0.58	8.98	4.49	13.56	8.10	13.56	13.56	
172.Z.15	3.85	9.29	1.55	1.29	1.03	0.86	0.77	0.64	9.60	4.80	15.17	8.80	16.17	15.17	
172.Z.16	4.11	9.97	1.66	1.39	1.11	0.92	0.83	0.69	10.22	5.11	16.73	9.45	16.73	16.73	
202.Z.15	4.21	11.02	1.84	1.53	1.22	1.02	0.92	0.76	13.72	6.86	17.97	8.78	17.97	17.97	
202.Z.16	4.49	12.20	2.03	1.69	1.36	1.13	1.02	0.85	14.60	7.30	19.89	9.46	19.89	19.89	
202.Z.18	5.03	14.47	2.41	2.01	1.61	1.34	1.21	1.00	16.35	8.17	23.57	10.74	23.57	23.57	
202.Z.20	5.57	16.62	2.77	2.31	1.85	1.54	1.38	1.15	18.08	9.04	27.04	11.92	27.04	27.04	
232.Z.16	5.11	14.68	2.45	2.04	1.63	1.36	1.22	1.02	21.61	10.81	23.92	13.66	23.92	23.92	
<b>SPAN 6.5m</b>															
172.Z.15	3.85	8.01	1.23	1.03	0.82	0.68	0.62	0.51	8.25	4.13	14.01	7.91	14.01	14.01	
172.Z.16	4.11	8.52	1.31	1.09	0.87	0.73	0.66	0.55	8.78	4.39	15.44	8.51	15.44	15.44	
202.Z.15	4.21	10.13	1.56	1.30	1.04	0.87	0.78	0.65	11.80	5.90	16.59	7.85	16.59	16.59	
202.Z.16	4.49	11.23	1.73	1.44	1.15	0.96	0.86	0.72	12.56	6.28	18.36	8.47	18.36	18.36	
202.Z.18	5.03	13.32	2.05	1.71	1.37	1.14	1.02	0.85	14.06	7.03	21.75	9.62	21.75	21.75	
202.Z.20	5.57	15.20	2.34	1.95	1.56	1.30	1.17	0.97	15.55	7.78	24.96	10.68	24.96	24.96	
232.Z.16	5.11	13.51	2.08	1.73	1.39	1.15	1.04	0.87	18.61	9.30	22.08	12.19	22.08	22.08	
232.Z.18	5.37	16.39	2.52	2.10	1.68	1.40	1.26	1.05	20.85	10.42	26.74	14.38	26.74	26.74	
<b>SPAN 7.0m</b>															
202.Z.15	4.21	9.37	1.34	1.12	0.89	0.74	0.67	0.56	10.27	5.13	15.40	7.11	15.40	15.40	
202.Z.16	4.49	10.39	1.48	1.24	0.99	0.82	0.74	0.62	10.92	5.46	17.05	7.67	17.05	17.05	
202.Z.18	5.03	11.89	1.70	1.41	1.13	0.94	0.85	0.71	12.23	6.12	20.20	8.71	20.20	20.20	
232.Z.16	5.11	12.51	1.79	1.49	1.19	0.99	0.89	0.74	16.19	8.10	20.50	11.02	20.50	20.50	
232.Z.18	5.73	15.17	2.17	1.81	1.45	1.20	1.08	0.90	18.14	9.07	24.83	13.02	24.83	24.83	
232.Z.20	6.34	17.75	2.54	2.11	1.69	1.41	1.27	1.06	20.07	10.04	29.01	15.00	29.01	29.01	
262.Z.18	6.25	17.45	2.49	2.08	1.66	1.39	1.25	1.04	24.43	12.22	28.53	13.90	28.53	28.53	
<b>SPAN 7.5m</b>															
202.Z.16	4.49	9.26	1.23	1.03	0.82	0.69	0.62	0.51	5.59	4.79	15.92	-	15.92	15.92	
202.Z.18	5.03	10.37	1.38	1.15	0.92	0.77	0.69	0.58	10.74	5.37	18.85	-	18.85	18.85	
232.Z.16	5.11	11.63	1.55	1.29	1.03	0.86	0.78	0.65	14.22	7.11	19.13	-	19.13	19.13	
232.Z.18	5.73	14.12	1.88	1.57	1.25	1.05	0.94	0.78	15.94	7.97	23.17	-	23.17	23.17	
232.Z.20	6.34	16.51	2.20	1.83	1.47	1.22	1.10	0.92	17.63	8.82	27.08	-	27.08	27.08	
232.Z.23	7.26	19.62	2.62	2.18	1.74	1.45	1.31	1.09	20.15	10.08	32.58	-	32.58	32.58	
262.Z.18	6.25	16.24	2.17	1.80	1.44	1.20	1.08	0.90	21.47	10.74	26.62	12.65	26.62	26.62	
262.Z.20	6.92	19.18	2.56	2.13	1.70	1.42	1.28	1.07	23.77	11.88	31.40	14.64	31.40	31.40	
<b>SPAN 8.0m</b>															
202.Z.20	5.57	10.07	1.26	1.05	0.84	0.70	0.63	0.52	10.51	5.25	20.28	-	20.28	20.28	
202.Z.23	6.35	11.50	1.44	1.20	0.96	0.80	0.72	0.60	12.00	6.00	24.00	-	24.00	24.00	
232.Z.16	5.11	10.68	1.36	1.13	0.91	0.75	0.68	0.57	12.60	6.30	17.94	-	17.94	17.94	
232.Z.18	5.73	13.19	1.65	1.37	1.10	0.92	0.82	0.69	14.11	7.06	21.73	-	21.73	21.73	
262.Z.18	6.25	15.17	1.90	1.58	1.26	1.05	0.95	0.79	19.03	9.51	24.96	-	24.96	24.96	
262.Z.20	6.92	17.92	2.24	1.87	1.49	1.24	1.12	0.93	21.06	10.53	29.43	-	29.43	29.43	
262.Z.23	7.92	21.83	2.73	2.27	1.82	1.52	1.36	1.14	24.08	12.04	35.80	-	35.80	35.80	
262.Z.25	8.59	24.32	3.04	2.53	2.03	1.69	1.52	1.27	26.07	13.03	39.85	-	39.85	39.85	
<b>SPAN 8.5m</b>															
232.Z.18	5.73	12.11	1.42	1.19	0.95	0.79	0.71	0.59	12.59	6.29	20.45	-	20.45	20.45	
232.Z.20	6.34	13.40	1.58	1.31	1.05	0.88	0.79	0.66	13.93	6.96	23.89	-	23.89	23.89	
262.Z.18	6.25	14.23	1.67	1.39	1.12	0.93	0.84	0.70	16.98	8.49	23.49	-	23.49	23.49	
262.Z.20	6.92	16.81	1.98	1.65	1.32	1.10	0.99	0.82	18.79	9.39	27.70	-	27.70	27.70	
262.Z.23	7.92	20.48	2.41	2.01	1.61	1.34	1.20	1.00	21.48	10.74	33.70	-	33.70	33.70	
262.Z.25	8.59	22.55	2.65	2.21	1.77	1.47	1.33	1.11	23.26	11.63	37.51	-	37.51	37.51	
<b>SPAN 9.0m</b>															
232.Z.18	5.73	10.79	1.20	1.00	0.80	0.67	0.60	0.50	11.30	5.65	19.31	-	19.31	19.31	
232.Z.20	6.34	11.94	1.33	1.11	0.88	0.74	0.66	0.55	12.50	6.25	22.56	-	22.56	22.56	
262.Z.18	6.25	13.38	1.49	1.24	0.99	0.83	0.74	0.62	15.24	7.62	22.19	-	22.19	22.19	
262.Z.20	6.92	15.82	1.76	1.46	1.17	0.98	0.88	0.73	16.87	8.44	26.16	-	26.16	26.16	
262.Z.23	7.92	18.59	2.07	1.72	1.38	1.15	1.03	0.86	19.29	9.64	31.82	-	31.82	31.82	
262.Z.25	8.59	20.13	2.24	1.86	1.49	1.24	1.12	0.93	20.89	10.44	35.42	-	35.42	35.42	
302.Z.23	9.04	23.84	2.65	2.21	1.77	1.47	1.32	1.10	28.63	14.31	39.26	-	39.26	39.26	
302.Z.25	9.80	26.86	2.98	2.49	1.99	1.66	1.49	1.24	31.01	15.51	44.18	-	44.18	44.18	
<b>SPAN 9.5m</b>															
262.Z.18	6.25	12.63	1.33	1.11	0.89	0.74	0.66	0.55	13.76	6.88	21.02	-	21.02	21.02	
262.Z.20	6.92	14.59	1.54	1.28	1.02	0.85	0.77	0.64	15.23	7.62	24.79	-	24.79	24.79	
262.Z.23	7.92	16.68	1.76	1.46	1.17	0.98	0.88	0.73	17.42	8.71	30.15	-	30.15	30.15	
262.Z.25	8.59	18.06	1.90	1.58	1.27	1.06	0.95	0.79	18.86	9.43	33.56	-	33.56	33.56	
302.Z.23	9.04	22.51	2.37	1.97	1.58	1.32	1.18	0.99	25.86	12.93	37.19	-	37.19	37.19	
302.Z.25	9.80	25.36	2.67	2.22	1.78	1.48	1.33	1.11	28.02	14.01	41.85	-	41.85	41.85	
<b>SPAN 10.0m</b>															
262.Z.18	6.25	11.88	1.19	0.99	0.79	0.66	0.59	0.49	12.49	6.25	19.97	-	19.97	19.97	
262.Z.20	6.92	13.15	1.31	1.10	0.88	0.73	0.66	0.55	13.83	6.91	23.55	-	23.55	23.55	
262.Z.23	7.92	15.03	1.50	1.25	1.00	0.84	0.75	0.63	15.81	7.90	28.54	-	28.54	28.54	
262.Z.25	8.59	16.27	1.63	1.36	1.08	0.90	0.81	0.68	17.12	8.56	31.88	-	31.88	31.88	
302.Z.23	9.04	21.31	2.13	1.78	1.42	1.18	1.07	0.89	23.48	11.74	35.33	-	35.33	35.33	
302.Z.25	9.80	24.01	2.40	2.00	1.60	1.33	1.20	1.00	25.44	12.72	39.76	-	39.76	39.76	
<b>SPAN 10.5m</b>															
262.Z.23	7.92	13.60	1.29	1.08	0.86	0.72	0.65	0.54	14.41</						

Zed purlin butt system [Metsec]

Factor	1.40	1.00	1.20	1.60	1.20	1.40	1.20	1.20	1.05
<b>Loading</b>	Dead load	Dead load restraining uplift or overturning	Dead load acting with wind and imposed loads combined	Imposed load	Imposed load acting with wind load	Wind load	Wind load acting with imposed load	Forces due to temperature effects	Drifting Snow

**Wind Assessment**  
 With reference to BS 5950 : Part 5 : 1987 'Code of Practice for design of cold formed sections' please note the following:- (Clause 2.2.2). "In the case of purlins an sheeting rails, local wind pressure and suction need to be considered".

The load tables contained in this technical catalogue are based on the criteria shown below and are the results of a extensive design and testing programme completed by using the facilities and skills of the Department of Mechanics of Materials at Strathclyde University.

**Performance**  
 The performance of the systems shown in the Technical Design Manual has been derived by calculation in accordance with BS 5950 Part 5, calibrated and proven by full scale tests. Purlin load tables are valid up to and including 25° roof slopes. For slopes greater than 25° use the Metspec Purlin computer design program.

SECTION REFEREN CE	WEIG HT kg/m	WORKING LOAD TOT AL U.D.L. kN	ALLOWABLE LOADNG in kN/m <sup>2</sup> PURLIN CENTRES in millimetres						DEFLECTION		ULTIMATE U.D.L. IN kN/SPAN			
									SPAN 180	SPAN 360	DOWN LOAD	Uplift – Metal Cladding		
			1000	1200	1500	1800	2000	2400				Number of Anti Sags		
<b>SPAN 3.5m</b>														
142.Z.14	3.16	8.63	2.46	2.05	1.64	1.37	1.23	1.03	9.29	4.64	13.95	8.19	13.95	13.95
142.Z.15	3.38	9.58	2.74	2.28	1.82	1.52	1.37	1.14	9.86	4.93	15.49	9.11	15.49	15.49
<b>SPAN 4.0m</b>														
142.Z.14	3.16	6.99	1.75	1.46	1.16	0.97	0.87	0.73	7.11	3.56	12.21	7.25	12.21	12.21
142.Z.15	3.38	7.42	1.85	1.55	1.24	1.03	0.93	0.77	7.55	3.77	13.55	8.07	13.55	13.55
142.Z.16	3.60	7.94	1.98	1.65	1.32	1.10	0.99	0.83	8.08	4.04	14.83	8.84	14.83	14.83
142.Z.18	4.03	8.87	2.22	1.85	1.48	1.23	1.11	0.92	9.03	4.52	17.25	10.24	16.98	16.98
<b>SPAN 4.5m</b>														
142.Z.15	3.38	5.82	1.29	1.08	0.86	0.72	0.65	0.54	5.97	2.98	12.05	7.20	12.05	12.05
172.Z.14	3.60	8.39	1.86	1.55	1.24	1.04	0.93	0.78	9.22	4.61	13.65	7.40	13.65	13.65
172.Z.15	3.85	9.40	2.09	1.74	1.39	1.16	1.04	0.87	9.85	4.93	15.27	8.32	15.27	15.27
172.Z.16	4.11	10.30	2.29	1.91	1.53	1.27	1.14	0.95	10.48	5.24	16.84	9.20	16.84	16.84
<b>SPAN 5.0m</b>														
172.Z.14	3.60	7.29	1.46	1.21	0.97	0.81	0.73	0.61	7.47	3.73	12.28	6.65	12.28	12.28
172.Z.15	3.85	7.79	1.56	1.30	1.04	0.87	0.78	0.65	7.98	3.99	13.75	7.49	13.75	13.75
172.Z.16	4.11	8.29	1.66	1.38	1.11	0.92	0.83	0.69	8.49	4.25	15.15	8.28	15.15	15.15
202.Z.15	4.21	9.99	2.00	1.67	1.33	1.11	1.00	0.83	11.62	5.81	16.28	7.94	16.28	16.28
202.Z.16	4.49	11.07	2.21	1.85	1.48	1.23	1.11	0.92	12.37	6.18	18.02	8.83	18.02	18.02
202.Z.18	5.03	13.13	2.63	2.19	1.75	1.46	1.31	1.09	13.85	6.92	21.35	10.49	21.35	21.35
<b>SPAN 5.5m</b>														
172.Z.14	3.60	5.98	1.09	0.91	0.72	0.60	0.54	0.45	6.17	3.09	11.17	6.02	11.17	11.17
172.Z.15	3.85	6.39	1.16	0.97	0.77	0.65	0.58	0.48	6.60	3.30	12.50	6.77	12.50	12.50
172.Z.16	4.11	6.80	1.24	1.03	0.82	0.69	0.62	0.51	7.02	3.51	13.78	7.49	13.78	13.78
202.Z.15	4.21	9.05	1.65	1.37	1.10	0.91	0.82	0.69	9.61	4.80	14.80	7.18	14.80	14.80
202.Z.16	4.49	9.98	1.81	1.51	1.21	1.01	0.91	0.76	10.22	5.11	16.38	7.98	16.38	16.38
202.Z.18	5.03	11.17	2.03	1.69	1.35	1.13	1.02	0.85	11.44	5.72	19.41	9.48	19.21	19.41
<b>SPAN 6.0m</b>														
202.Z.15	4.21	7.82	1.30	1.09	0.87	0.72	0.65	0.54	8.07	4.04	13.57	6.52	13.32	13.57
202.Z.16	4.49	8.32	1.39	1.16	0.92	0.77	0.69	0.58	8.59	4.29	15.02	7.25	14.12	15.02
202.Z.18	5.03	9.32	1.55	1.29	1.04	0.86	0.78	0.65	9.62	4.81	17.19	8.62	15.78	17.43
232.Z.16	5.11	11.02	1.84	1.53	1.22	1.02	0.92	0.77	12.94	6.47	18.05	8.39	18.05	18.05
232.Z.18	5.73	13.37	2.23	1.86	1.49	1.24	1.11	0.93	14.50	7.25	21.87	10.22	21.87	21.87
232.Z.20	6.34	15.64	2.61	2.17	1.74	1.45	1.30	1.09	16.04	8.02	25.55	11.92	25.55	25.55
<b>SPAN 6.5m</b>														
202.Z.18	5.03	7.78	1.21	1.01	0.81	0.67	0.61	0.50	8.19	4.10	16.42	7.87	12.89	14.91
202.Z.20	5.57	8.71	1.34	1.12	0.89	0.74	0.67	0.56	9.06	4.53	18.85	9.00	14.24	16.45
232.Z.16	5.11	10.13	1.56	1.30	1.04	0.87	0.78	0.65	11.03	5.51	16.67	7.69	16.67	16.67
232.Z.18	5.73	11.99	1.84	1.54	1.23	1.02	0.92	0.77	12.36	6.18	20.19	9.37	20.19	20.19
262.Z.18	6.25	14.15	2.18	1.81	1.45	1.21	1.09	0.91	16.90	8.45	23.19	10.03	23.19	23.19
262.Z.20	6.92	16.71	2.57	2.14	1.71	1.43	1.29	1.07	18.70	9.35	27.35	11.83	27.35	27.35
<b>SPAN 7.0m</b>														
232.Z.16	5.11	9.16	1.31	1.09	0.87	0.73	0.65	0.55	9.51	4.75	15.48	7.07	15.25	15.48
232.Z.18	5.73	10.26	1.47	1.22	0.98	0.81	0.73	0.61	10.65	5.33	18.74	8.63	17.06	18.74
262.Z.18	6.25	13.08	1.87	1.56	1.25	1.04	0.93	0.78	14.57	7.28	21.53	9.24	21.40	21.53
262.Z.20	6.92	15.46	2.21	1.84	1.47	1.23	1.10	0.92	16.13	8.06	25.39	10.90	23.64	25.39
262.Z.23	7.92	17.89	2.56	2.13	1.70	1.42	1.28	1.07	18.44	9.22	30.89	13.14	26.90	29.92
<b>SPAN 7.5m</b>														
232.Z.18	5.73	8.86	1.18	0.98	0.79	0.66	0.59	0.49	9.28	4.64	17.49	-	14.26	16.67
262.Z.18	6.25	12.16	1.62	1.35	1.08	0.90	0.81	0.68	12.69	6.35	20.10	8.54	17.97	20.10
262.Z.20	6.92	13.54	1.81	1.50	1.20	1.00	0.90	0.75	14.05	7.02	23.70	10.08	19.85	22.94
262.Z.23	7.92	15.48	2.06	1.72	1.38	1.15	1.03	0.86	16.06	8.03	28.83	12.15	22.59	26.11
262.Z.25	8.59	16.76	2.23	1.86	1.49	1.24	1.12	0.93	17.39	8.70	32.09	13.39	24.43	28.22
<b>SPAN 8.0m</b>														
262.Z.18	6.25	10.66	1.33	1.11	0.89	0.74	0.67	0.56	11.15	5.58	18.84	-	15.12	18.01
262.Z.20	6.92	11.80	1.48	1.23	0.98	0.82	0.74	0.61	12.35	6.17	22.22	-	16.72	19.89
262.Z.23	7.92	13.49	1.69	1.41	1.12	0.94	0.84	0.70	14.12	7.06	27.03	-	19.03	22.62
262.Z.25	8.59	14.61	1.83	1.52	1.22	1.01	0.91	0.76	15.28	7.64	30.09	-	20.59	24.45
302.Z.23	9.04	20.22	2.53	2.11	1.68	1.40	1.26	1.05	21.31	10.65	33.34	13.31	29.73	33.34
<b>SPAN 8.5m</b>														
262.Z.20	6.92	10.36	1.22	1.02	0.81	0.68	0.61	0.51	10.94	5.47	20.91	-	14.16	17.18
262.Z.23	7.92	11.84	1.39	1.16	0.93	0.77	0.70	0.58	12.50	6.25	25.44	-	16.13	19.54
262.Z.25	8.59	12.82	1.51	1.26	1.01	0.84	0.75	0.63	13.54	6.77	28.32	-	17.46	21.11
302.Z.23	9.04	18.12	2.13	1.78	1.42	1.18	1.07	0.89	18.87	9.44	31.38	-	25.43	29.64
302.Z.25	9.80	19.63	2.31	1.92	1.54	1.28	1.15	0.96	20.45	10.22	35.31	-	27.38	31.95
<b>SPAN 9.0m</b>														
262.Z.25	8.59	11.32	1.26	1.05	0.84	0.70	0.63	0.52	12.08	6.04	26.74	-	-	18.24
262.Z.29	9.90	13.03	1.45	1.21	0.97	0.80	0.72	0.60	13.90	6.95	31.96	-	-	20.83
302.Z.23	9.04	16.04	1.78	1.48	1.19	0.99	0.89	0.74	16.84	8.42	29.64	-	21.82	26.05
302.Z.25	9.80	17.37	1.93	1.61	1.29	1.07	0.97	0.80	18.24	9.12	33.35	-	23.50	28.06
<b>SPAN 9.5m</b>														
302.Z.23	9.04	14.27	1.50	1.25	1.00	0.83	0.75	0.63	15.11	7.56	28.08	-	18.81	22.84
302.Z.25	9.80	15.46	1.63	1.36	1.08	0.90	0.81	0.68	16.37	8.18	31.60	-	20.27	24.60
342.Z.25	10.98	22.38	2.36	1.96	1.57	1.31	1.18	0.98	23.40	11.70	37.68	-	29.95	35.28
342.Z.29	12.68	25.80	2.72	2.26	1.81	1.51	1.36	1.13	26.98	13.49	46.45	-	34.29	40.40
<b>SPAN 10.0m</b>														
302.Z.23	9.04	12.75	1.28	1.06	0.85	0.71	0.64	0.53	13.64	6.82	26.67	-	16.31	20.04
302.Z.25	9.80	13.81	1.38	1.15	0.92	0.77	0.69	0.58	14.77	7.39	30.02	-	17.58	21.57
342.Z.25	10.98	20.04	2.00	1.67	1.34	1.11	1.00	0.84	21.12	10.56	35.80	-	26.07	31.32
342.Z.29	12.68	23.11	2.31	1.93	1.54	1.28	1.16	0.96	24.35	12.17	44.13	-	29.87	35.85
342.Z.32	13.94	25.38	2.54	2.11	1.69	1.41	1.27	1.06	26.74	13.37	50.07	-	32.84	3

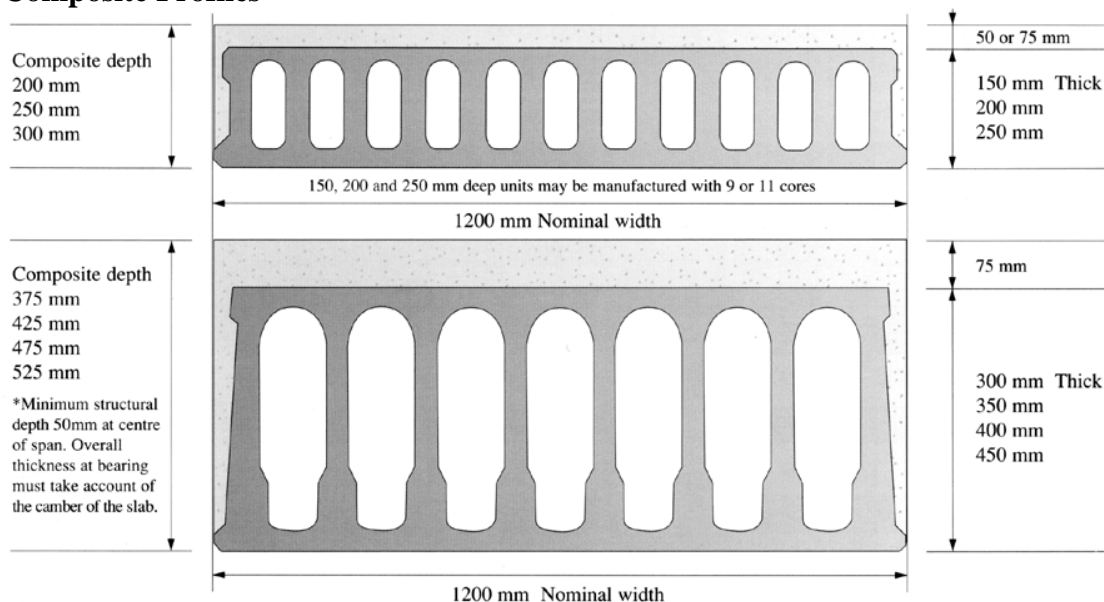
### D.4 Precast hollow composite concrete floors [Bison]

**LOAD / SPAN TABLE**

Overall structural depth mm	Unit depth	Available fire period	Self Wt KN/m <sup>2</sup>	Spans indicated below allow for characteristic service load (live load) Plus self weight plus 1.5 kN/m <sup>2</sup> for finishes								
				Characteristic service loads kN/m <sup>2</sup>								
				0.75	1.5	2.0	2.5	3.0	4.0	5.0	10.0	15.0
Effective span in metres												
200	150	1 Hour or 2 Hours	3.6	8.2	8.2	8.2	8.1	7.9	7.5	7.1	5.8	5.0
250	200	2 Hours or 4 Hours	4.1	10.5	10.1	9.8	9.6	9.3	8.9	8.5	6.9	6.0
300	250	2 Hours	4.5	12.0	11.6	11.3	11.0	10.7	10.1	9.6	7.9	6.8
375	300	2 Hours	5.7	14.2	13.7	13.4	13.2	12.9	12.4	12.0	10.3	9.2
425	350	2 Hours	6.2	15.7	15.2	14.9	14.6	14.3	13.7	13.3	11.5	10.3
475	400	2 Hours	6.6	16.7	16.2	15.9	15.6	15.3	14.7	14.2	12.4	11.1
525	450	2 Hours	7.1	18.0	17.4	17.1	16.8	16.5	15.9	15.4	13.4	12.1

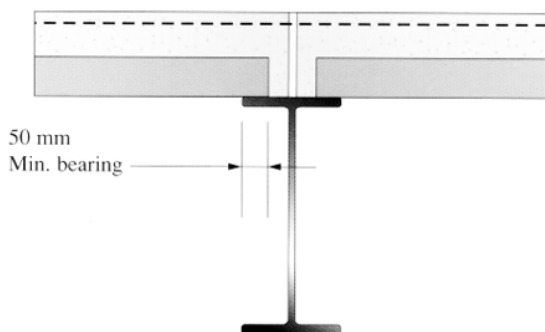
The above data is based upon 50 or 75mm structural topping of C30 concrete which should be regarded as a minimum. Other topping depths may be recommended in some circumstances. Design data for alternative combinations are available from Bison Design Offices. Topping reinforcement, daywork and movement joints should be considered in relation to the overall structural concept of the building.

### Composite Profiles



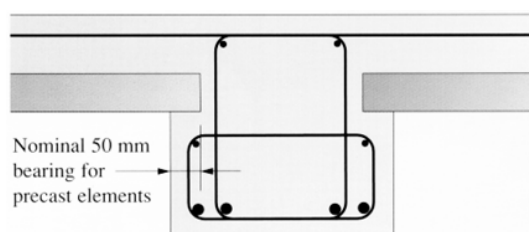
### Simple bearing on top flange of steelwork

Nominal support reinforcement and/or daywork joints Determined by general layout and site operation



### Insitu construction

Solid composite floors may be placed on insitu beam downstands or supported on shutters before pouring site concrete



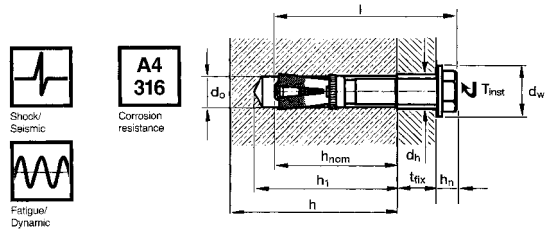


D.5 Heavy duty anchors (Hilti HSL) [Hilti - feb 1994]

**Features:** high loading capacity  
force controlled expansion  
reliable pull-down of part fastened  
suitable for dynamic loading  
no rotation when tightening bolt

**Bolt material:** 8.8, ISO 898 T1  
Galvanised to min 5 µm

**Versions:**  
**Hilti HSLB heavy-duty anchor with inspection control**  
Features: - Automatic torque control  
**Hilti HSLG heavy-duty anchor with threaded rod**  
Feature: - Various threaded rod lengths



**Bolt/rod material**  
HSLG 8.8, ISO 898 T1, galvanised to min 5 µm  
HSLG-R: X5CrNi Mo1810, 1,4401, A4-70 DIN 267 T11 (stainless steel)

**Setting Details**

Setting details	Anchor	M 8/20	M 8/40	M 10/20	M 10/40	M 12/25	M 12/50	M 16/25	M 16/50	M 20/30	M 20/60	M 24/30	M 24/60
d <sub>o</sub> (mm) Drill bit diameter		12		15		18		24		28		32	
h <sub>1</sub> (mm) Hole depth		80		90		100		125		155		180	
h <sub>nom</sub> (mm) Min. depth of embedment		65		75		80		105		130		155	
t <sub>fix</sub> (mm) Max. thickness fastened		20	40	20	40	25	50	25	50	30	60	30	60
l (mm) Anchor length		95	115	107	127	120	145	148	173	183	213	205	235
h <sub>n</sub> (mm) Head weight + washer		7.5		10		11		14		17		19	
T <sub>inst</sub> (Nm) Tightening torque	HSL	25		50		80		200		380		500	
	HGSG-LR							120		200			
Max. gap (mm)		4		5		8		9		12		16	
S <sub>w</sub> (mm) Width across flats	HSL	13		17		19		24		30		36	
	HSLB					24		30		36		41	
d <sub>h</sub> (mm) Max. clearance hole		14		17		20		26		31		35	
d <sub>w</sub> (mm) Washer diameter		20		25		30		40		45		50	
h (mm) Min. base material thickness		120		140		160		180		220		270	
Drill bit		TE-C-12/20 TE-Y-12/34		TE-C-15/25 TE-Y-15/34		TE-C-18/20 TE-Y-18/34		TE-C-24/25 TE-Y-24/32		TE-Y-28/37		TE-Y-32/37	
Drilling system		TE10, TE14, TE18-M TE24, TE54		TE14, TE18-M, TE24 TE54				TE24, TE54, TE74		TE54, TE74		TE54, TE74	

**Recommended load F<sub>30</sub>, in kN, non-cracked  
Concrete f<sub>cc</sub> = N/mm<sup>2</sup>, V = 3.0**

Anchor size	M8	M10	M12	M16	M20	M24	
Tensile N	0	6.9	10.4	15.0	25.7	34.6	45.5
Combined Load	30	7.9	12.5	18.2	31.3	42.6	55.9
	45	8.4	13.6	19.8	34.2	46.6	61.1
	60	8.8	14.6	21.3	37.0	50.6	66.2
Shear V	90	9.8	16.7	24.5	42.6	58.6	76.6

**Recommended load for specific application:**

$F_{rec} = F_{30} f_B f_T f_A f_R$   
**Influence of concrete strength f<sub>B</sub>**  
 $F_B = 1 + 0.02 (1 - \alpha/90) (f_{cc,act} - 30)$   
 For (20 ≤ f<sub>cc,act</sub> ≤ 55)  
**Influence of depth embedment f<sub>T</sub>**  
 $f_T = \frac{h_{act}}{h_{nom}}$   
 Limiting depth of embedment  
 $h_{lim} = 1.5 h_{nom}$   
 $h_{act}$  actual embedment depth

**Influence of anchor spacing and edge distance f<sub>A</sub>, f<sub>R</sub>**

Spacing S (mm)	Reduction Factors (Anchor Spacing) f <sub>A</sub>						Edge Distance C (mm)	Reduction Factors (Edge Distance) f <sub>R</sub>											
	Tensile/Shear							Tensile f <sub>RN</sub>											
	Anchor size							Anchor size											
	M8	M10	M12	M16	M20	M24		M8	M10	M12	M16	M20	M24	M8	M10	M12	M16	M20	M24
65	0.70	0					65	0.70	0					0.30	0				
75	0.72	0.70	0				75	0.73	0.70	0				0.37	0.30	0			
80	0.73	0.71	0.70	0			80	0.75	0.71	0.70	0			0.40	0.33	0.30	0		
105	0.79	0.76	0.74	0.70	0		105	0.82	0.78	0.76	0.70	0		0.59	0.49	0.44	0.30	0	
130	0.85	0.81	0.79	0.73	0.70	0	130	0.90	0.85	0.83	0.74	0		0.77	0.64	0.59	0.41	0.30	0
155	0.90	0.86	0.84	0.77	0.73	0.70	155	0.97	0.91	0.88	0.79	0.73	0.70	0.95	0.80	0.74	0.52	0.39	0.30
175	0.95	0.90	0.87	0.80	0.77	0.71	162	1.0	0.93	0.90	0.80	0.75	0.71	1.0	0.84	0.78	0.55	0.41	0.32
195	1.0	0.94	0.91	0.82	0.80	0.73	187		1.0	0.96	0.85	0.78	0.74		1.0	0.92	0.66	0.50	0.39
225		1.0	0.97	0.87	0.82	0.76	200			1.0	0.88	0.80	0.75			1.0	0.72	0.55	0.43
240			1.0	0.89	0.87	0.78	225			1.0	0.92	0.84	0.79			1.0	0.83	0.64	0.51
275			1.0	0.94	0.89	0.81	265			1.0	0.91	0.84				1.0	0.79	0.63	
315				1.0	0.94	0.85	275			1.0	0.92	0.85				1.0	0.82	0.66	
350					1.0	0.88	300			1.0	0.96	0.88				1.0	0.91	0.73	
395						0.92	325				1.0	0.92					1.0	0.81	
430						0.96	350				1.0	0.95						1.0	0.89
470						1.0	390				1.0								1.0