Holorib the original:

with STRUX® 90/40 fibre reinforced concrete

Load span and fire resistance tables for the use of Holorib with STRUX® 90/40 fibre reinforced concrete in steel deck composite floors.

RICHARD LEES STEEL DECKING

1 hr Fire Rating

NORMAL WEIGHT CONCRETE

Holorib 0.9mm

1hr Fire Rating

STRUX® 90/40 at 5.3kg/m³		Maximum span (m) for given Imposed Load kN/m²						Maximum span (m) for given Imposed Load kN/m²					
		Unfactored Imposed Loading kN/m²						Unfactored Imposed Loading kN/m²					
Slab Depth mm	Concrete Volume (m³/m²)	5.0	6.0	6.7	7.5	10.0	12.0	5.0	6.0	6.7	7.5	10.0	12.0
		Continuous Spans - Support Centres m ▲▲▲						Continuous Spans - Support Centres m ▲▲▲					
		Unpropped						Propped at Centre Span					
100	0.092	3.25	3.25	3.25	3.25	3.02	2.75	3.50	3.50	3.39	3.23	2.85	2.62
120	0.112	3.10	3.10	3.10	3.10	3.10	3.05	4.15	3.86	3.69	3.52	3.12	2.87
130	0.122	3.03	3.03	3.03	3.03	3.03	3.03	4.30	4.01	3.84	3.67	3.25	3.00
140	0.132	2.95	2.95	2.95	2.95	2.95	2.95	4.44	4.15	3.97	3.80	3.37	3.11
150	0.142	2.88	2.88	2.88	2.88	2.88	2.88	4.58	4.28	4.10	3.92	3.48	3.22
175	0.167	2.73	2.73	2.73	2.73	2.73	2.73	4.87	4.57	4.39	4.20	3.75	3.47
200	0.192	2.59	2.59	2.59	2.59	2.59	2.59	5.12	4.82	4.64	4.45	3.98	3.70

Holorib 1.2mm

1hr Fire Rating

STRUX® 90/40 at 5.3kg/m³		Maximum span (m) for given Imposed Load kN/m²						Maximum span (m) for given Imposed Load kN/m²					
		Unfactored Imposed Loading kN/m²						Unfactored Imposed Loading kN/m²					
Slab Depth mm	Concrete Volume (m³/m²)	5.0	6.0	6.7	7.5	10.0	12.0	5.0	6.0	6.7	7.5	10.0	12.0
		Continuous Spans - Support Centres m ▲▲▲						Continuous Spans - Support Centres m ▲▲▲					
		Unpropped						Propped at Centre Span					
100	0.092	3.50	3.50	3.50	3.50	3.44	3.24	3.50	3.50	3.50	3.50	3.44	3.24
120	0.112	3.64	3.64	3.64	3.64	3.64	3.64	4.20	4.20	4.20	4.20	4.03	3.79
130	0.122	3.56	3.56	3.56	3.56	3.56	3.56	4.55	4.55	4.55	4.55	4.33	4.05
140	0.132	3.48	3.48	3.48	3.48	3.48	3.48	4.90	4.90	4.90	4.90	4.55	4.21
150	0.142	3.41	3.41	3.41	3.41	3.41	3.41	5.25	5.25	5.25	5.25	4.71	4.36
175	0.167	3.25	3.25	3.25	3.25	3.25	3.25	6.00	6.00	5.90	5.66	5.06	4.69
200	0.192	3.11	3.11	3.11	3.11	3.11	3.11	6.00	6.00	6.00	5.99	5.37	4.99

NORMAL WEIGHT CONCRETE

LIGHTWEIGHT CONCRETE

Holorib 0.9mm

1hr Fire Rating

STRUX® 90/40 at 5.3kg/m³		Maximum span (m) for given Imposed Load kN/m²						Maximum span (m) for given Imposed Load kN/m²					
		Unfactored Imposed Loading kN/m²						Unfactored Imposed Loading kN/m²					
Slab Depth mm	Concrete Volume (m³/m²)	5.0	6.0	6.7	7.5	10.0	12.0	5.0	6.0	6.7	7.5	10.0	12.0
		Continuous Spans - Support Centres m ▲▲▲						Continuous Spans - Support Centres m ▲▲▲					
		Unpropped						Propped at Centre Span					
100	0.092	3.00	3.00	3.00	3.00	3.00	2.75	3.00	3.00	3.00	3.00	2.88	2.65
120	0.112	3.31	3.31	3.31	3.31	3.31	3.05	3.60	3.60	3.60	3.59	3.16	2.91
130	0.122	3.24	3.24	3.24	3.24	3.24	3.19	3.90	3.90	3.90	3.74	3.30	3.04
140	0.132	3.17	3.17	3.17	3.17	3.17	3.17	4.20	4.20	4.07	3.88	3.43	3.16
150	0.142	3.11	3.11	3.11	3.11	3.11	3.11	4.50	4.40	4.21	4.02	3.55	3.27
175	0.167	2.97	2.97	2.97	2.97	2.97	2.97	5.06	4.72	4.52	4.32	3.83	3.54
200	0.192	2.83	2.83	2.83	2.83	2.83	2.83	5.34	5.00	4.79	4.59	4.08	3.77

Holorib 1.2mm

1hr Fire Rating

STRUX® 90/40 at 5.3kg/m³		Maximum span (m) for given Imposed Load kN/m²						Maximum span (m) for given Imposed Load kN/m²					
		Unfactored Imposed Loading kN/m²						Unfactored Imposed Loading kN/m²					
Slab Depth mm	Concrete Volume (m³/m²)	5.0	6.0	6.7	7.5	10.0	12.0	5.0	6.0	6.7	7.5	10.0	12.0
		Continuous Spans - Support Centres m ▲▲▲						Continuous Spans - Support Centres m ▲▲▲					
		Unpropped						Propped at Centre Span					
100	0.092	3.00	3.00	3.00	3.00	3.00	2.99	3.00	3.00	3.00	3.00	3.00	2.99
120	0.112	3.60	3.60	3.60	3.60	3.60	3.50	3.60	3.60	3.60	3.60	3.60	3.50
130	0.122	3.81	3.81	3.81	3.81	3.81	3.76	3.90	3.90	3.90	3.90	3.90	3.76
140	0.132	3.73	3.73	3.73	3.73	3.73	3.73	4.20	4.20	4.20	4.20	4.20	4.02
150	0.142	3.66	3.66	3.66	3.66	3.66	3.66	4.50	4.50	4.50	4.50	4.50	4.28
175	0.167	3.51	3.51	3.51	3.51	3.51	3.51	5.25	5.25	5.25	5.25	5.17	4.78
200	0.192	3.37	3.37	3.37	3.37	3.37	3.37	6.00	6.00	6.00	6.00	5.51	5.10

LIGHTWEIGHT CONCRETE

1.5 hrs Fire Rating

NORMAL WEIGHT CONCRETE

Holorib 0.9mm

1.5 hrs Fire Rating

STRUX® 90/40 at 5.3kg/m³		Maximum span (m) for given Imposed Load kN/m²						Maximum span (m) for given Imposed Load kN/m²					
		Unfactored Imposed Loading kN/m²						Unfactored Imposed Loading kN/m²					
Slab Depth mm	Concrete Volume (m³/m²)	5.0	6.0	6.7	7.5	10.0	12.0	5.0	6.0	6.7	7.5	10.0	12.0
		Continuous Spans - Support Centres m ▲▲▲						Continuous Spans - Support Centres m ▲▲▲					
		Unpropped						Propped at Centre Span					
110	0.102	3.17	3.10	2.99	2.84	2.58	2.41	3.25	3.10	2.99	2.84	2.58	2.41
120	0.112	3.10	3.10	3.10	3.00	2.69	2.52	3.38	3.22	3.12	3.00	2.69	2.52
130	0.122	3.03	3.03	3.03	3.03	2.82	2.63	3.56	3.37	3.24	3.12	2.82	2.63
140	0.132	2.95	2.95	2.95	2.95	2.92	2.73	3.66	3.48	3.35	3.23	2.92	2.73
150	0.142	2.88	2.88	2.88	2.88	2.88	2.83	3.77	3.59	3.45	3.34	3.02	2.83
175	0.167	2.73	2.73	2.73	2.73	2.73	2.73	4.02	3.84	3.71	3.58	3.26	3.06
200	0.192	2.59	2.59	2.59	2.59	2.59	2.59	4.29	4.10	3.97	3.84	3.51	3.31

Holorib 1.2mm

1.5 hrs Fire Rating

STRUX® 90/40 at 5.3kg/m³		Maximum span (m) for given Imposed Load kN/m²						Maximum span (m) for given Imposed Load kN/m²					
		Unfactored Imposed Loading kN/m²						Unfactored Imposed Loading kN/m²					
Slab Depth mm	Concrete Volume (m³/m²)	5.0	6.0	6.7	7.5	10.0	12.0	5.0	6.0	6.7	7.5	10.0	12.0
		Continuous Spans - Support Centres m ▲▲▲						Continuous Spans - Support Centres m ▲▲▲					
		Unpropped						Propped at Centre Span					
110	0.102	3.72	3.54	3.40	3.27	2.94	2.73	3.75	3.54	3.40	3.27	2.94	2.73
120	0.112	3.64	3.64	3.55	3.41	3.07	2.87	3.90	3.69	3.55	3.41	3.07	2.87
130	0.122	3.56	3.56	3.56	3.54	3.20	2.98	4.03	3.83	3.68	3.54	3.20	2.98
140	0.132	3.48	3.48	3.48	3.48	3.32	3.10	4.16	3.95	3.81	3.66	3.32	3.10
150	0.142	3.41	3.41	3.41	3.41	3.41	3.22	4.29	4.08	3.93	3.79	3.44	3.22
175	0.167	3.25	3.25	3.25	3.25	3.25	3.25	4.55	4.34	4.19	4.05	3.69	3.47
200	0.192	3.11	3.11	3.11	3.11	3.11	3.11	4.82	4.61	4.46	4.31	3.95	3.71

NORMAL WEIGHT CONCRETE

LIGHTWEIGHT CONCRETE

Holorib 0.9mm

1.5 hrs Fire Rating

STRUX® 90/40 at 5.3kg/m³		Maximum span (m) for given Imposed Load kN/m²						Maximum span (m) for given Imposed Load kN/m²					
		Unfactored Imposed Loading kN/m²						Unfactored Imposed Loading kN/m²					
Slab Depth mm	Concrete Volume (m³/m²)	5.0	6.0	6.7	7.5	10.0	12.0	5.0	6.0	6.7	7.5	10.0	12.0
		Continuous Spans - Support Centres m ▲▲▲						Continuous Spans - Support Centres m ▲▲▲					
		Unpropped						Propped at Centre Span					
105	0.097	3.15	3.15	3.15	3.02	2.70	2.52	3.15	3.15	3.15	3.02	2.70	2.52
120	0.112	3.31	3.31	3.31	3.19	2.85	2.65	3.60	3.47	3.32	3.19	2.85	2.65
130	0.122	3.24	3.24	3.24	3.24	2.99	2.79	3.84	3.63	3.48	3.34	2.99	2.79
140	0.132	3.17	3.17	3.17	3.17	3.13	2.91	3.99	3.77	3.62	3.48	3.13	2.91
150	0.142	3.11	3.11	3.11	3.11	3.11	3.04	4.15	3.92	3.77	3.63	3.26	3.04
175	0.167	2.97	2.97	2.97	2.97	2.97	2.97	4.53	4.30	4.13	3.98	3.59	3.36
200	0.192	2.83	2.83	2.83	2.83	2.83	2.83	4.91	4.67	4.50	4.34	3.93	3.68

Holorib 1.2mm

1.5 hrs Fire Rating

STRUX® 90/40 at 5.3kg/m³		Maximum span (m) for given Imposed Load kN/m²						Maximum span (m) for given Imposed Load kN/m²					
		Unfactored Imposed Loading kN/m²						Unfactored Imposed Loading kN/m²					
Slab Depth mm	Concrete Volume (m³/m²)	5.0	6.0	6.7	7.5	10.0	12.0	5.0	6.0	6.7	7.5	10.0	12.0
		Continuous Spans - Support Centres m ▲▲▲						Continuous Spans - Support Centres m ▲▲▲					
		Unpropped						Propped at Centre Span					
105	0.097	3.15	3.15	3.15	3.15	3.06	2.84	3.15	3.15	3.15	3.15	3.06	2.84
120	0.112	3.60	3.60	3.60	3.59	3.22	2.99	3.60	3.60	3.60	3.59	3.22	2.99
130	0.122	3.81	3.81	3.81	3.77	3.38	3.14	3.90	3.90	3.90	3.77	3.38	3.14
140	0.132	3.73	3.73	3.73	3.73	3.52	3.28	4.20	4.20	4.09	3.92	3.52	3.28
150	0.142	3.66	3.66	3.66	3.66	3.66	3.42	4.50	4.41	4.23	4.08	3.66	3.42
175	0.167	3.51	3.51	3.51	3.51	3.51	3.51	5.06	4.80	4.61	4.44	4.01	3.75
200	0.192	3.37	3.37	3.37	3.37	3.37	3.37	5.44	5.17	4.98	4.81	4.35	4.07

LIGHTWEIGHT CONCRETE

2 hrs Fire Rating

NORMAL WEIGHT CONCRETE

Holorib 0.9mm — 2 hrs Fire Rating

STRUX® 90/40 at 5.3kg/m³		Maximum span (m) for given Imposed Load kN/m²						Maximum span (m) for given Imposed Load kN/m²					
		Unfactored Imposed Loading kN/m²						Unfactored Imposed Loading kN/m²					
Slab Depth mm	Concrete Volume (m³/m²)	5.0	6.0	6.7	7.5	10.0	12.0	5.0	6.0	6.7	7.5	10.0	12.0
		Continuous Spans - Support Centres m ▲▲▲						Continuous Spans - Support Centres m ▲▲▲					
		Unpropped						Propped at Centre Span					
125	0.117	3.06	2.98	2.88	2.72	2.47	2.33	3.13	2.98	2.88	2.72	2.47	2.33
130	0.122	3.03	3.01	2.88	2.82	2.50	2.38	3.20	3.01	2.88	2.82	2.50	2.38
140	0.132	2.95	2.95	2.95	2.91	2.64	2.47	3.31	3.14	3.02	2.91	2.64	2.47
150	0.142	2.88	2.88	2.88	2.88	2.73	2.56	3.41	3.24	3.13	3.02	2.73	2.56
160	0.152	2.82	2.82	2.82	2.82	2.81	2.64	3.49	3.33	3.21	3.10	2.81	2.64
175	0.167	2.73	2.73	2.73	2.73	2.73	2.73	3.62	3.45	3.33	3.22	2.94	2.76
200	0.192	2.59	2.59	2.59	2.59	2.59	2.59	3.82	3.66	3.54	3.42	3.13	2.95

Holorib 1.2mm — 2 hrs Fire Rating

STRUX® 90/40 at 5.3kg/m³		Maximum span (m) for given Imposed Load kN/m²						Maximum span (m) for given Imposed Load kN/m²					
		Unfactored Imposed Loading kN/m²						Unfactored Imposed Loading kN/m²					
Slab Depth mm	Concrete Volume (m³/m²)	5.0	6.0	6.7	7.5	10.0	12.0	5.0	6.0	6.7	7.5	10.0	12.0
		Continuous Spans - Support Centres m ▲▲▲						Continuous Spans - Support Centres m ▲▲▲					
		Unpropped						Propped at Centre Span					
125	0.117	3.59	3.39	3.25	3.13	2.84	2.63	3.59	3.39	3.25	3.13	2.84	2.63
130	0.122	3.56	3.44	3.31	3.20	2.88	2.69	3.63	3.44	3.31	3.20	2.88	2.69
140	0.132	3.48	3.48	3.45	3.32	3.00	2.81	3.75	3.57	3.45	3.32	3.00	2.81
150	0.142	3.41	3.41	3.41	3.41	3.11	2.91	3.88	3.69	3.56	3.43	3.11	2.91
160	0.152	3.35	3.35	3.35	3.35	3.20	3.00	3.98	3.79	3.66	3.52	3.20	3.00
175	0.167	3.25	3.25	3.25	3.25	3.25	3.13	4.11	3.92	3.79	3.66	3.33	3.13
200	0.192	3.11	3.11	3.11	3.11	3.11	3.11	4.33	4.14	4.00	3.88	3.55	3.34

NORMAL WEIGHT CONCRETE

LIGHTWEIGHT CONCRETE

Holorib 0.9mm — 2 hrs Fire Rating

STRUX® 90/40 at 5.3kg/m³		Maximum span (m) for given Imposed Load kN/m²						Maximum span (m) for given Imposed Load kN/m²					
		Unfactored Imposed Loading kN/m²						Unfactored Imposed Loading kN/m²					
Slab Depth mm	Concrete Volume (m³/m²)	5.0	6.0	6.7	7.5	10.0	12.0	5.0	6.0	6.7	7.5	10.0	12.0
		Continuous Spans - Support Centres m ▲▲▲						Continuous Spans - Support Centres m ▲▲▲					
		Unpropped						Propped at Centre Span					
115	0.107	3.34	3.19	3.06	2.93	2.63	2.45	3.38	3.19	3.06	2.93	2.63	2.45
120	0.112	3.31	3.19	3.06	2.93	2.63	2.45	3.38	3.19	3.06	2.93	2.63	2.45
130	0.122	3.24	3.24	3.12	2.99	2.69	2.50	3.45	3.25	3.12	2.99	2.69	2.50
140	0.132	3.17	3.17	3.17	3.11	2.80	2.61	3.57	3.38	3.24	3.11	2.80	2.61
150	0.142	3.11	3.11	3.11	3.11	2.91	2.71	3.70	3.50	3.36	3.23	2.91	2.71
175	0.167	2.97	2.97	2.97	2.97	2.97	2.97	3.99	3.79	3.64	3.51	3.17	2.97
200	0.192	2.83	2.83	2.83	2.83	2.83	2.83	4.31	4.10	3.95	3.81	3.45	3.23

Holorib 1.2mm — 2 hrs Fire Rating

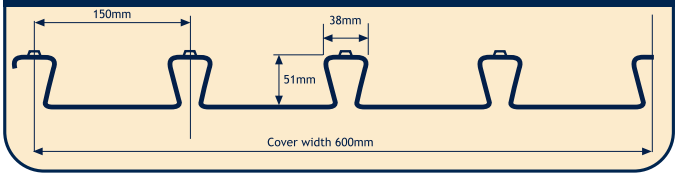
STRUX® 90/40 at 5.3kg/m³		Maximum span (m) for given Imposed Load kN/m²						Maximum span (m) for given Imposed Load kN/m²					
		Unfactored Imposed Loading kN/m²						Unfactored Imposed Loading kN/m²					
Slab Depth mm	Concrete Volume (m³/m²)	5.0	6.0	6.7	7.5	10.0	12.0	5.0	6.0	6.7	7.5	10.0	12.0
		Continuous Spans - Support Centres m ▲▲▲						Continuous Spans - Support Centres m ▲▲▲					
		Unpropped						Propped at Centre Span					
115	0.107	3.45	3.45	3.45	3.31	2.97	2.77	3.45	3.45	3.45	3.31	2.97	2.77
120	0.112	3.60	3.60	3.45	3.31	2.97	2.77	3.60	3.60	3.45	3.31	2.97	2.77
130	0.122	3.81	3.69	3.53	3.39	3.04	2.83	3.90	3.69	3.53	3.39	3.04	2.83
140	0.132	3.73	3.73	3.66	3.52	3.16	2.95	4.05	3.82	3.66	3.52	3.16	2.95
150	0.142	3.66	3.66	3.66	3.66	3.29	3.07	4.18	3.96	3.80	3.66	3.29	3.07
175	0.167	3.51	3.51	3.51	3.51	3.51	3.34	4.49	4.26	4.10	3.95	3.57	3.34
200	0.192	3.37	3.37	3.37	3.37	3.37	3.37	4.81	4.57	4.41	4.25	3.86	3.61

LIGHTWEIGHT CONCRETE

Fire performance criteria

1. The fire resistance tables are based on data from full-scale fire tests carried out in accordance with BS EN 1365-2 at the Warrington Fire Research Centre - Test Report No. 133152.
2. The tables are applicable for end bay conditions where the slabs are continuous over the penultimate supporting beam (or wall), i.e. the concrete slab is continuous over more than one span irrespective of the deck span.
3. The tablulated slab depths comply with the minimum fire insulation requirements specified in BS 5950-8.
4. For conditions outside the scope of the simplified tables, including all isolated single spanning slabs, the Fire Engineering "Analytical design method" as specified in BS 5950-8 should be adopted as detailed in the Steel Construction Institute publication 056, or use RLSD's Deckspan design software.
5. An ultimate load factor of 1.0 is adopted in the preparation of the tables. It may be possible, however, to extend the effective spanning capabilities of the slab by applying a lower factor to the non-permanent imposed load.
6. The loads shown are total including all imposed live and dead loads, excluding only the self-weight of the slab which is already taken into account in the preparation of the tables.
7. The table assumes the use of a concrete with a minimum compressive strength equivalent to grade 30 N/mm^2.

Section Dimensions



Holorib Section Properties (per metre width)

Gauge mm	Self Weight kg/m^2	Self Weight kN/m^2	Area mm^2	Inertia cm^4	YNA mm
0.9	12.8	0.126	1,597	64.4	16.7
1.0	14.3	0.140	1,780	72.0	16.7
1.2	17.1	0.168	2,145	87.2	16.8

Notes applicable to span/load tables

1. Spans shown assume clear span +100mm to the centreline of supports.
2. Designs are fully in accordance with BS 5950: Parts 4 & 6.
3. The dead weight of the slab has been included in the development of the spans shown. However, consideration should be given to finishes, partitions, walls, etc. when reading from the table.
4. Based upon concrete densities at wet stage: normal weight concrete 2400 kg/m^3, lightweight concrete 1900 kg/m^3.
5. Concrete volumes: Figures shown in the tables are nominal values based on constant slab thickness. As with all steel decks, an allowance should be made for the deflected form of the soffit when ordering concrete and, as guidance, we suggest that the estimated volume of concrete equates to: Overall slab depth - 8mm for voids + span/250.
6. A span to depth ratio limit of 35:1 for normal weight concrete and 30:1 for lightweight concrete is generally used. Where isolated single spans occur, these ratios are reduced to 30:1 and 25:1 respectively.
7. Maximum deflections are limited to span/130 after taking account of ponding.
8. Construction stage design includes an allowance of 4.5/L ⩾1.5kN/m^2 for construction loading.
9. Composite slabs are designed as simply supported irrespective of the deck support configuration.
10. S350 decking is manufactured from material meeting the specification: BS EN 10147-S350GD+Z275-N-A-C, i.e. yield strength = 350 N/mm^2.

Note: S350 yield strength is referred to in British Standards and this terminology replaces superseded reference **Z35**.

Longitudinal shear strength

For design in accordance with BS 5950-3:1990, the shear resistance (v_r) of concrete reinforced with 5.3kg/m^3 of STRUX® 90/40 fibres is equivalent to $2A_{cv}$ N/mm^2 per unit length of each shear plane under consideration. A_{cv} is the appropriate cross-sectional area per unit length of beam of the concrete in any shear plane.

To this longitudinal shear resistance may be added a component (v_p), as appropriate, arising from the tensile strength of the deck.

For design in accordance with BS EN 1994-1-1: 2004 (EC4), the shear resistance (v_{Ed}) of concrete reinforced with 5.3kg/m^3 of STRUX® 90/40 fibres is equivalent to $2h_f.\Delta_x$ N/mm^2 per unit length of each shear plane under consideration. h_f is the appropriate effective thickness of the concrete flange and Δ_x is the length under consideration (half the span for a simply supported beam with a UDL)

To this longitudinal shear resistance may be added a component (v_{pd}), as appropriate, arising from the tensile strength of the deck.

Shear stud resistance

Testing established that the performance of stud connectors was enhanced when embedded in specimens using concrete reinforced with 5.3kg/m^3 of STRUX® 90/40 fibres, compared to identical specimens using conventional reinforcement bars. This was demonstrated by an improvement in both shear resistance and ductility and demonstrates that the BS 5950-3:1990 or BS EN 1994-1-1: 2004 codified stud reduction factors (*k*) can be adopted without additional modification.

Principle Benefits of Reinforcing Composite Steel Decks with STRUX® 90/40

Extensive testing, specified and verified by the Steel Construction Institute, has shown that STRUX® 90/40 can be an ideal replacement for steel fabric reinforcement in steel composite decks designed and supplied by Richard Lees Steel Decking Ltd. This testing has shown that, not only can the STRUX® reinforcement meet the physical requirements for longitudinal shear and composite interaction in the floor plate, but also that with Holorib, a fire rating of up to two hours can be achieved. The benefits of selecting STRUX® over traditional reinforcement are described below: -

Advantages over steel fabric reinforcement

STRUX® reinforcement is premixed into the concrete so that when concrete is delivered to site it is immediately ready to be pumped and placed.

Project time & cost:

- An entire step of fixing steel fabric reinforcement is eliminated from the job, saving contract time and simplifying management and logistics.
- Lifting sheets of fabric to each floor requires crane time & conflicts of requirements with other contractors can lead to lost time.
- Productivity improvements of choosing STRUX® over steel fabric reinforcement lead to overall reduced job cost.

Safety

- Fixing sheets of fabric at height is a hazardous operation & is eliminated.
- Lifting & accepting sheets of fabric at each floor is a hazardous operation & is eliminated.
- Fixed sheets of fabric is a hazardous surface to walk on when placing concrete at height.

Flexibility & ease of application

- On congested sites access to deliver and properly place the sheets of fabric at each floor can be problematic. With STRUX®, the required reinforcement is already in the concrete.

Superior crack control

- Even when sheets of fabric are properly placed, they can be easily displaced from their required optimum position before and during the concrete pour.
- STRUX® fibres are uniformly distributed throughout the entire mass of concrete, so cracks are restrained from propagating, regardless of where they initiate.

Advantages of STRUX® over steel fibres

The high strength to weight ratio of STRUX® 90/40 and high fineness compared to steel fibres leads to very different dosage rates of the two materials. In composite floor slabs STRUX® 90/40 is added at a dosage rate of 5.3kg/m^3. A similar application using steel fibres would require a dosage of 30kg/m^3.

Clear advantages of STRUX® include:

- **Ease of addition:**
  No specialist equipment is needed to add STRUX® to the mixing plant. A simple platform or suitable mobile steps will give safe access for adding the material.
- **Safe & easy to handle:**
  Individual bags of STRUX® are light (2.3kg), safe and easy to handle.
- **Good pumping characteristics:**
  When used in conjunction with the right mix design, STRUX® 90/40 fibres display excellent pumping characteristics, minimising job downtime through equipment problems.

Concrete containing STRUX® 90/40 synthetic structural fibre reinforcement for composite floor construction

Guidelines for Concrete Producers

The following guidelines are designed to assist concrete producers with the efficient batching and dispersion of STRUX® 90/40 synthetic structural fibres and to provide concrete that has optimised pumping, placing and finishing characteristics.

1. Mix design

1.1 The dosage of STRUX® 90/40 for this application has been set at 5.3kg/m^3. This has been determined by extensive research programmes into the behaviour of composite floors using Richard Lees Steel Decking profiles and must not be altered without engineering approval. The addition of fibres will reduce the workability and the apparent paste volume of the concrete. In order to supply a concrete with optimum pumping, placing and finishing characteristics, these effects will need to be addressed by attention to the mix design and the selection of an appropriate and proven superplasticising admixture. The recommended admixture for this application is ADVA®, supplied by Grace Construction Products.

1.2 Typically we would recommend that an optimum paste volume for concrete with 5.3kg/m^3 of STRUX® 90/40 would be achieved with a cementitious content of 360kg and a coarse to fines ratio set at 45%. Where possible, trial mixes should be performed to determine a suitable mix and Grace Construction Products will provide technical advice where requested.

1.3 The exact water content and admixture dose are best determined experimentally.

2. Dry batching

2.1 STRUX® 90/40 synthetic structural fibres are supplied in concrete dispersible bags; either 0.5kg or 2.3kg. The whole bags can be added into the mixing operation without the need to open them. The appropriate number of bags can be added to the empty truck prior to loading with concrete. A suitable safe loading platform or safety steps should be provided to give the operator secure access to the mixer truck.

2.2 Once the STRUX® 90/40 bags have been loaded, 200 litres of water should then be added. This water addition assists the bags to break up, releasing their contents.

2.3 On completion of the weighing of the aggregates into the weigh hopper, a small amount (e.g. 0.5 - 1.0 tonne) of preferably coarse aggregates should be released into the truck. The truck (now containing the full quantity of fibres, ~ 200 litres of water and a portion of the aggregates alone) should be mixed for 2 - 3 minutes to allow the coarse aggregates to abrade and disperse the fibres thoroughly.

2.4 The remaining aggregates and cementitious materials can now be loaded into the truck along with further water. Mixing should now proceed as usual, targeting an initial slump of 50 - 70mm, before the addition of ADVA®. Once this has been achieved, the appropriate dosage of ADVA® should be added to increase the workability to 140 - 180mm.

3. Wet mixing

3.1 In wet mixed plants the bags of STRUX® 90/40 are normally added directly into the mixer prior to charging with aggregates. However this procedure may depend on the mixer and overall plant specifications and it is recommended that Grace Construction Products are consulted for advice on the best method of fibre addition.

Guidelines for Contractors

These guidelines are designed to provide contractors with advice on how best to pump, place, compact and finish concrete floors containing STRUX® 90/40 synthetic structural fibre reinforcement.

1. Concrete pumping

1.1 Mix Design and Workability

When STRUX® 90/40 is used in concrete for Holorib and Ribdeck composite floor slabs it is always used at a fixed dosage of 5.3kg/m^3. This requires careful attention to mix design in order to ensure that there is sufficient paste volume to coat the fibres fully. In general we recommend a pump mix with a minimum fine aggregate to coarse aggregate ratio of 45%.

STRUX® 90/40 reinforced concrete should be delivered and discharged into the pump hopper at a workability of between 140mm - 180mm, i.e. high enough to allow the concrete to fall through the hopper grill without stacking up, but not so high as to promote segregation of the concrete in the pump line, particularly while pumping has ceased during concrete truck change-over. An approved superplasticising admixture must be used to reinstate the workability lost through the addition of fibres. Grace Construction Products strongly recommends that ADVA® be used, which also provides lubrication to the concrete, reducing pumping pressures.

2. Concrete placing, compacting and finishing operations

figure 1

2.1 Placing the concrete

Placing and levelling STRUX® 90/40 reinforced concrete should be carried out exactly as per normal concrete. The high dosage of fibre reinforcement in the concrete may give the apparent appearance of over cohesiveness, but raking/levelling will not be affected and will require no more than usual effort. Additionally, where ADVA® Floor 200 has been used, this will assist the concrete in levelling, compaction and finishing.

2.2 Compacting the concrete

The best plant suited for compacting fibre reinforced concrete is the 'Magi Screed' *as figure 1*;

The concrete should be compacted sufficiently to ensure that adequate paste is brought to the surface to allow easy finishing, particularly when power floating. If this method of applying some form of surface vibration to the fibre reinforced concrete is not used, then a high number of fibres will appear at the surface of the concrete. This may not be an issue if the concrete floor is being covered by insulation etc. but if the specified finish is power floating, then the use of the Magi Screed greatly assists in achieving a satisfactory surface.

2.3 Finishing the concrete surface

After compaction with the Magi Screed, an easy float *(refer figure 2)* is usually passed over the concrete to close up the surface.

figure 2

figure 3

2.4 Once the fibre reinforced concrete has been levelled, compacted and floated, it is allowed to cure in accordance with good concreting practice. If a power float finish has been specified, then the surface of the concrete floor is usually closed up using a "panning" operation, followed by the floating operation as shown in *figure 3*.

If the type of floating machine shown in *figure 3* is used, then some fibres will be seen in the surface of the finished concrete floor.
If a ride-on machine is used *(refer figure 4)*, then usually all of the fibres disappear during the floating operation.

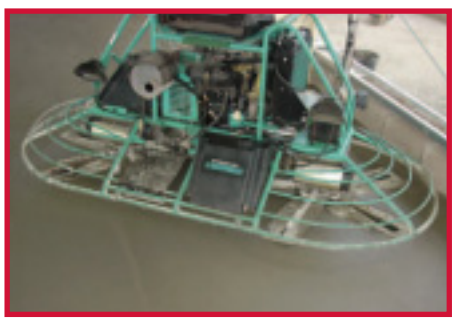


figure 4

Holorib is fully implemented in the RAM Structural System software. Engineers can quickly compare alternative designs using Richard Lees Steel Decking profiles whilst producing calculations, steel tonnages and construction drawings for structural frames.

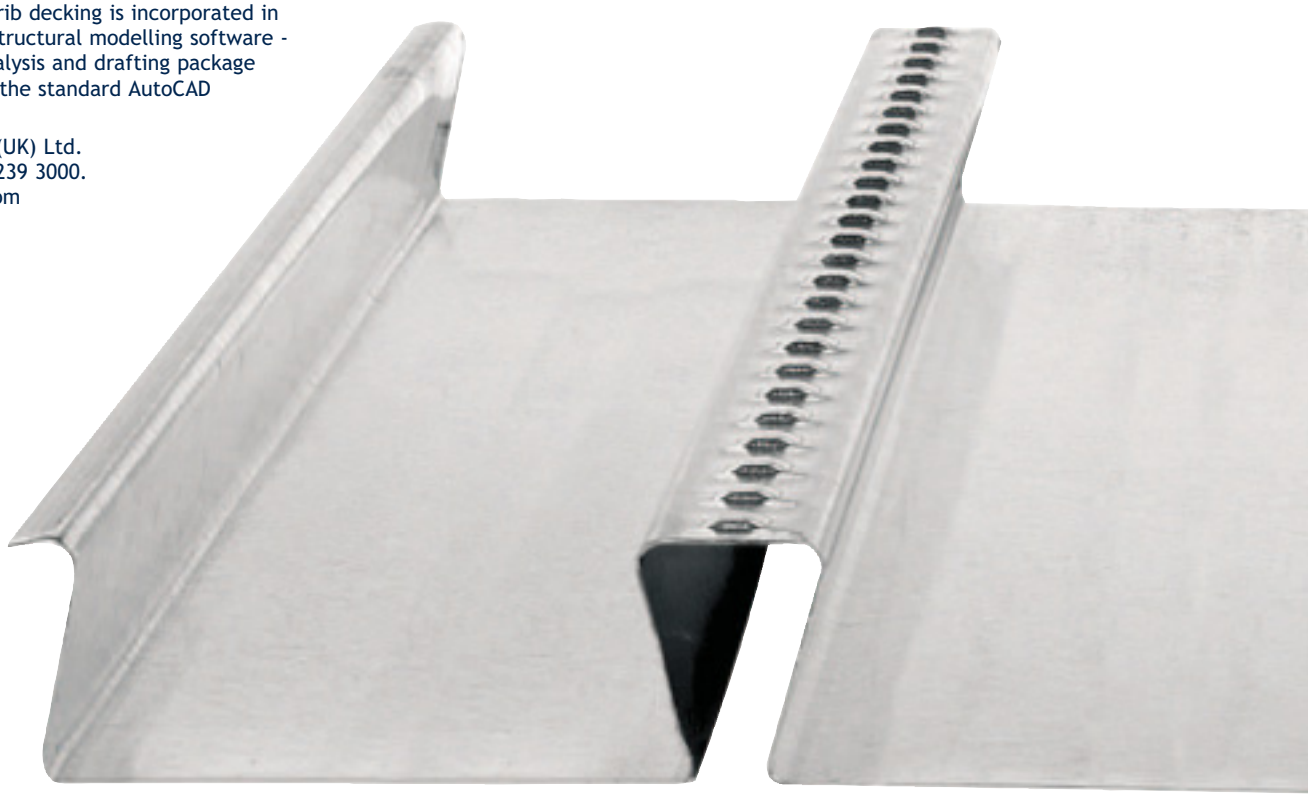
Supplied by RAM International
Tel: +44 (0) 141 353 5168.
www.ramint.co.uk

The only analysis tool that can predict the damped floor response achievable with Resotec. Providing automatic stud and section design, Compos is the premiere tool for composite analysis and design.

Supplied by Oasys Ltd
Tel: +44 (0) 191 238 7559
www.oasys-software.com

Detailing of Holorib decking is incorporated in 3D+ parametric structural modelling software - an integrated analysis and drafting package operating within the standard AutoCAD environment.

Supplied by CSC (UK) Ltd.
Tel: +44 (0) 113 239 3000.
www.cscworld.com



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